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31 JAN 1938

ANNUAL REPORT

ON THE

Agricultural Department

1936

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Annual Report on the Agricultural Department, Nigeria, 1936.

Transfer of Mr. Faulkner to Malaya.

1. In July, 1936, Mr. O. T. Faulkner, who had been Director of Agriculture, Nigeria, since 1921 was transferred to Malaya. The loss to the Department, and to Nigeria can hardly be overestimated. During his long tenure of office as Director Mr. Faulkner had gained a vast knowledge of the agricultural problems of the country and in times such as the present when the need for improved Agricultural methods is becoming more and more urgent the country could ill afford to lose him. Fortunately Mr. Faulkner had formulated and followed such a clear and definite policy, and had made his plans for further development on such sound lines that steady progress in the future is assured. This and future reports for many years to come will be a record of the progress of work which was initiated by him.

Mr. Faulkner's Policy.

2. Mr. Faulkner realised that the great problem of all Agricultural Departments in Tropical Africa is the maintenance of soil fertility. The solution of this problem must of necessity continue to be the chief object of our experimental work for without it there can be no real improvement in native agricultural methods. He always taught that if a method of maintaining soil fertility could be found which the native farmer was capable of adopting the latter would at once be able to grow a greater quantity of his own food crops on a smaller area of land, and this would in turn enable him to grow more crops for export. He however also realised that the farmer cannot be expected to adopt practices which are not sound, whether from the agricultural or the economic point of view, and he always insisted that every idea must be thoroughly tested on our experimental farms before any farmer was advised to adopt it, and even then only a few farmers should be asked to give it a trial in the first instance. Under his guidance a system of mixed farming for the Northern Provinces was worked out, and is being successfully introduced, while a system of maintaining soil fertility by means of green manuring has also been evolved which is suitable for a large area of the Southern Provinces. That this system or some modification of it will be generally adopted by the farmers sooner or later is almost certain.

3. Mr. Faulkner also realised that the European Agricultural Officer or Specialist must always be an expensive luxury in West Africa and that therefore no effort should be spared to train Africans to take as much responsibility as possible, and to ensure that both European and African staff are themselves thoroughly competent to farm under Nigerian conditions. Therefore the experimental farms in addition to providing the necessary information on which to base our extension work, also became the training grounds for both European and African staff. Mr. Faulkner's policy has more than justified itself and as it is wholeheartedly supported by every member of the Department, its continuance is assured. That the work of the Department continued to run smoothly in the interval between Mr. Faulkner's departure and the

appointment of his successor was due to the loyal co-operation of all members of the staff, both European and African, and in particular to the efforts of Dr. Bryce the Assistant Director of Agriculture, Southern Provinces, who also for a short period acted as Director, and Mr. A. G. Beattie who acted as Assistant Director of Agriculture, Northern Provinces, until the arrival from Uganda of Mr. G. F. Clay, O.B.E., M.C., who was appointed to fill that post.

Increase of Staff.

4. The new post of Senior Agricultural Officer which was provided in the Estimates for 1936-37 has been filled by the promotion of Mr. I. E. James. A further post for a second Senior Agricultural Officer has been provided in the current year's estimates. The Senior Agricultural Officers will not only act as reliefs for the Assistant Directors when the latter are on leave but will also relieve them of much routine work at headquarters thus enabling them to keep in closer touch with both extension work, and the experimental work which is being carried out at out-stations. This is essential if a consistent policy is to be maintained, and the work of the Department is to continue to progress on sound lines.

5. The staff of Agricultural officers was increased during the year from thirty-eight to forty-one, and the new appointments were all posted to the Southern Provinces. This has enabled us to strengthen the teams in the Eastern Provinces and in the Oyo Province and also permanently to post an officer to the Warri Province to develop rice growing and oil palm planting in that area. An extra Agricultural officer was also posted to the Cameroons to take charge of the work in connection with the introduction of Produce Inspection. No new appointments were made for the Northern Provinces, for before we could undertake further expansion there it was necessary to allow a breathing space for consolidating the work started in new areas during the previous two years.

6. The type of officer who is now being recruited for the Agricultural service, is entirely satisfactory and the training which is given at the Imperial College, Trinidad, furnishes the newly appointed officer with a real knowledge of tropical Agriculture before he arrives here. He is thus able to gain the confidence of the farmers remarkably quickly, and to undertake responsible duties with the least possible delay.

Visit of Sir F. A. Stockdale.

7. Mention was made in last year's report of the visit of Sir F. A. Stockdale the Agricultural Adviser to the Secretary of State. In his report on his visit which has since been published Sir Frank was able to state that " It was with pleasure that I reported to His Excellency that there could be no doubt that the Department of Agriculture was performing sound work in all directions and that marked progress had been made since my visit to Nigeria in 1929." Sir Frank made several suggestions for the further development of the work of the Department all of which are receiving attention.

Locusts.

8. Little damage was done by locusts in 1936. Fewer flying swarms were reported than in 1935, but there was a heavy hopper infestation at the end of the year in Zaria and the Niger Provinces. It seems likely that the outbreak of locusts which commenced in 1929 is steadily getting less and less severe, but it is clear that we

cannot yet afford to relax our efforts to find and destroy as many hopper bands as possible, for any general relaxation in this direction might easily give rise to a recrudescence of the locust menace. The Entomologist visited the Lake Chad area in January and February, 1937, and made a survey of the suspected outbreak centre of the Red Locust. The floods of 1936-37 were more extensive than any which have occurred during the last thirty years and the area of grassland suitable for red locusts was thus considerably reduced. Red locusts were found in habitats which had escaped inundation only in the neighbourhood of Kalkala. They were however not numerous and all the specimens collected were in the solitary phase. Only two migratory locusts were seen during the survey. The Nigerian Government has expressed its willingness to contribute within reasonable limits towards the cost of any scheme which may be decided upon for the establishment of a permanent organisation in the Middle Niger for the control of the Migratory Locust.

Extension of Mixed Farming.

9. The figures given below show the rate of progress which is being made in introducing mixed farming:—

Year.	No. started during the year.	*Failures during the year.	Total continuing at the end of the year.
1928	3	...	3
1929	9	5	7
1930	13	3	17
1931	31	4	44
1932	71	7	108
1933	84	19	173
1934	139	14	298
1935	348	25	621
1936	473	41	1,053

* "Failures" include all men who give up the system for any cause, including even death, when the heir is not capable or willing to continue the system.

The distribution among the various Emirates of the farmers who have adopted mixed farming is given in the following table:—

Distribution of Mixed Farmers.

Emirate.	No. at end of 1935.	No. started during the year 1936.	*Failures during the year.	Total continuing at the end of 1936.
Zaria	237	101	11	327
Birnin Gwari	1	3	...	3
Kano	68	134	7	195
Kazaure	14	12	...	26
Gumel	14	6	3	17
Hadeija	1	2	...	1
Katsina	135	117	13	239
Daura	46	66	...	112
Sokoto	80	21	4	100
Sokoto (Rice Farmers) ...	13	2	3	12
Argungu	1	...	...	1
Gwandu	10	4	...	14
Kontagora	1	1	...	2
Bauchi	...	4	...	4
Total	**621**	**473**	**41**	**1,053**

* "Failures" include all men who give up the system for any cause, including even death, when the heir is not capable or willing to continue the system.

10. The increase of 432 new farmers during the year compares with an increase of 125 during 1934 and 323 during 1935. This is very encouraging progress especially when the revolutionary

nature of the new system is taken into consideration. There has been a notable increase in the number of " failures " during the year, the total number being forty-one against twenty-five in the previous year. With increasing numbers it is impossible to give the same personal supervision to individual farmers as formerly, and it is a waste of the time of our staff to persevere with men who make little or no attempt to carry out our instructions, especially as other farmers are waiting to be set up. We have therefore taken a much stronger line with really inefficient farmers than hitherto, and if after repeated warnings they have made no effort to improve they have been closed down, and their cattle and implements have been sold to new farmers. But progress should not be measured entirely by numbers. The most satisfactory feature of our extension work during the last two seasons has been the increase in the number of genuine peasant farmers who have started mixed farming. These have again increased from 252 at the end of 1935 to 475 at the end of 1936. In the following table all persons who have adopted mixed farming are classified according to their social positions:—

Emirate.	Emirs and N. A. Executive Officials.	Village Heads.	Peasant Farmers.	Others.	Total end of 1936.
Zaria	20	49	255	3	327
Birnin Gwari ...	...	...	3	1	4
Kano	26	79	74	16	195
Kazaure	5	6	14	1	26
Gumel	6	6	5	...	17
Hadeija	3	...	...	...	3
Katsina	22	108	69	40	239
Daura	7	55	37	13	112
Sokoto	37	28	18	14	97
Sokoto (Rice Farmers on irrigated land)	...	1	...	11	12
Gwandu	11	3	...	...	14
Argungu	1	...	...	...	1
Kontagora ...	2	...	..	...	2
Bauchi	4	...	...	...	4
Total ...	144	335	475	99	1,053

Progress has been particularly marked in this respect in the Katsina and Kano Provinces, and has been well maintained in the Zaria Province. A start has been made in the Bauchi and Niger Provinces, and in the N'guru area of the Bornu Province, and there is every prospect that progress will be rapid in these new areas—especially in the Bauchi Province—as soon as the advantages of the system have been fully demonstrated. For reasons which will be given in a later paragraph the system which we have so far demonstrated, is not entirely suitable for many of the more distant parts of the Sokoto Province, so that we are now concentrating on those parts of the Province in which experience has shown that it is satisfactory. In these areas the improvement in both numbers and the type of farmer is entirely satisfactory.

11. While the present rate of progress is most encouraging from the technical point of view, it is still comparatively small quantitatively, and it will have to be greatly accelerated before we shall be able to say that we are really revolutionising the agricultural system of Northern Nigeria, or before we can say that mixed farming is causing a really big increase in production. The setting up and supervision of even such a comparatively small number

as 500 new farmers needs a considerable amount of careful organisation. It involves the purchase and training of not less than 1,000 bullocks, all of which have to be sent to the Veterinary camps for immunisation against rinderpest and in most cases pleuro pneumonia and black quarter as well. In order to obtain the animals as cheaply as possible it is desirable to buy them during the rainy season. But as most new farmers wish to be set up during the dry season they have to be fed and maintained for several months until they are distributed to farmers. In addition arrangements have to be made for the provision of ploughs, and cultivators and for the training of either the farmers themselves or of their sons in the use of cattle and implements and the conservation of both manure and fodder. We must clearly aim at setting up much greater numbers every year, in addition to supervising the old mixed farmers and introducing to them new improvements in the system. This is mainly a question of organisation, for I do not think that from now onwards progress will be retarded by the number of farmers who wish to start. The evolution of a suitable organisation for dealing with really large numbers is therefore one of our main problems, and one which is being carefully studied by all Agricultural officers. The addition of a fodder farm to most of our farm centres and demonstration farms has already helped to solve the problem of the maintenance and distribution of " pool " cattle, and all our farms are used as training grounds for both men and animals. We have also received assistance from some of the older mixed farmers who have undertaken to train cattle and boys for new farmers. A few of the older men are also assisting us by keeping animals which have not been distributed on their own farms for a few months for the sake of the manure which the latter produce, but this although a most desirable arrangement can only be developed slowly as farmers have to be taught that even cattle which are regarded primarily as manure producers must receive an adequate quantity of food.

Price of Cattle.

12. The increase in produce prices, particularly in the Southern Provinces has resulted in a rapid rise in the price of cattle. An animal suitable for work which could have been purchased for £1 10s. a year or two ago is now worth from £2 10s. to £3 and in some districts animals are difficult to obtain even at this price, for at present the demand is greater than the supply, and when buying cattle for mixed farmers we have to enter into direct competition with the butchers. The latter are in much closer touch with the Fulani herdsmen than we can ever hope to be and by a system of advances of cash are able to secure the best animals before we have a chance of making an offer for them. Last year the difficulty was overcome to some extent by sending an officer to buy cattle in the Bauchi Province where cattle are much cheaper than in Provinces served by the Railway. This procedure was very satisfactory, and he was able to purchase some eighty head of stock comparatively cheaply. It will probably have to be continued on a much larger scale in the future, and in addition we may have to purchase young animals and maintain them for a year or two until they are sufficiently well grown to make them suitable for distribution. The rise in the cost of working animals emphasises the value of a cow to the mixed farmer, as the man who owns a cow and can breed his own working animals is in a very strong position.

Supply of Cows.

13. The question of supplying cows to mixed farmers is still in an unsatisfactory position. It is almost impossible for the farmer to purchase a reasonably good cow from the Fulani and

it is becoming very clear that in the main farmers will either have to depend on obtaining their cows from our stock farms, or pressure will have to be brought to bear on the Fulani to sell some of their cows to the Native Administrations for distribution to farmers. Owing to drastic culling of the Shika and Samaru herds last year, very few cows were available for distribution to mixed farmers this year so that very little progress was made in this matter. Proposals for an extension of the Shika stock farm are under consideration, but it will be several years before we shall be able regularly to supply cows from the stock farms in reasonable numbers. In the meantime the steady rise in the price of cattle and the increase in the number of new farmers have greatly increased the urgency of this problem. The working life of a bullock is not much more than five years so that in addition to setting up new farmers we shall also have to provide replacements for existing farmers unless the latter are in a position to breed their own replacements.

The Advance System.

14. In spite of the general increase in the prosperity of the Nigerian farmer, nearly every farmer still requires an advance before he can start mixed farming, and most established farmers are anxious to obtain further advances in order to equip themselves with cows and with carts. Furthermore owing to the increase in the cost of cattle, and the desirability of supplying the more efficient but, compared with the wooden plough, more expensive imported plough it is impossible to keep the initial advance below £5 as we were formerly able to do. Most advances now amount to from £8 to £10. Many farmers however are able to make a cash payment of from 25s. to 30s. before they receive their cattle and implements, and owing to the increase in the price of agricultural produce they are still able to repay these increased advances in the specified four years without hardship. The present system by which advances are made to individual farmers by the Native Administrations has done more than anything else to make the introduction of mixed farming possible, and it is clear that it will have to be continued and expanded if steady progress is to be maintained. The following table shows the total number of individual advances and how they are distributed in varying amounts among the farmers:—

Emirate.	No. of Mixed Farmers.	Total No. of farmers with outstanding advances of £10 or over.	Total No. of farmers with outstanding advances of £8–£10.	Total No. of farmers with outstanding advances of £6–£8.	No. of farmers with outstanding advances under £6.	No. of farmers with no advances outstanding.
Zaria	327	2	28	78	198	21
Birnin Gwari ...	3	1	...	2	...	...
Katsina ...	239	1	1	35	143	59
Hadeija ...	1	...	...	...	1	...
Gumel	17	...	2	10	5	...
N'guru	1	...	...	...	...	1
Kano	195	10	13	55	88	29
Kazaure ...	26	...	4	12	10	...
Bauchi	2	...	...	...	2	...
Misau	1	...	...	...	...	1
Katagum ...	1	...	...	...	...	1
Kontagora ...	2	...	...	...	...	2
Daura	112	...	...	21	80	11
Sokoto (Gusau area) ...	60	2	7	13	18	20
Sokoto (Sokoto area) ...	40	...	3	3	21	13
Sokoto (Kworre area) ...	12	1	7	3	1	...
Sokoto (B'Kebbi area) ...	14	1	3	1	6	3
	1,053	18	68	243	573	151

15. An unavoidable feature of the system is that it involves an enormous amount of work connected with accounts. Accounts occupy a great deal of the time of all Agricultural officers engaged on extension work which should preferably be spent on purely agricultural work. This question is now receiving careful attention, and a simplified system of accounts suggested by the Audit Department will shortly be adopted. When the new system is in working order we hope that much of the routine work now done by Agricultural officers will be done by the African staff. Further expansion depends upon the ability of the Native Administration organisation to make itself entirely responsible for the collection of repayments. Theoretically this has always been a function of the Native Administrations but in actual fact Agricultural Officers have been obliged to give the matter very close supervision. In the more advanced Native Administrations such as Katsina it has now become a routine procedure for all repayments to be collected by the District Heads, who regard it as part of their duties; it is hoped that a similar development will gradually take place in all Emirates.

Co-operative Societies and Mixed Farming.

16. A possible solution of many of our difficulties in dealing with much greater numbers seems to lie in the establishment of Co-operative Credit Societies. If the Native Administration instead of lending money to individual farmers could lend it to Co-operative Societies the amount of accounting to be done by both Agricultural Officers and the Native Administrations would be greatly reduced, as the accounts of the societies themselves would be supervised by the Co-operative Department. Thus Agricultural Officers would be relieved of these duties in connection with accounts. Co-operative Societies when successfully established would also be of value as the medium for the distribution of cattle and implements. The possibility of introducing co-operation in connection with mixed farming is being investigated by the Registrar, Co-operative Societies and by an Administrative Officer who was recently selected to make a detailed study of the whole question. But the introduction of a system of co-operative societies must of necessity proceed very slowly and we cannot therefore anticipate that they will be of any great assistance to us in the immediate future.

Supply of Carts to Farmers.

17. There is a very genuine demand among all mixed farmers for light carts—it is safe to say that every mixed farmer would like to own a cart, for a cart is a very profitable part of their equipment. In one or two instances farmers have actually made as much as 7s. 6d. per day by using their carts for the transport of produce from bush markets to the railway. But at present the cart is an expensive luxury which only the more wealthy can afford even if some part of the cost is met by an advance. At present all carts are supplied to farmers by the Agricultural Department. Steel wheels and axles are imported from England and the bodies are made by our carpenters. The present cost of the cheapest cart is as follows:—

	£	s.	d.
Price of Wheels and Axles landed Zaria	4	19	6
Cost of Body	2	5	0
	£7	4	6

The total number of carts supplied to date is seventy-two, an increase of thirty-four during the year.

The use of Improved Bulls.

18. The whole object of our stock breeding work is gradually to improve the cattle of Nigeria and it is therefore important that every farmer should have an opportunity of mating his cow to a good bull. This matter does not however present any serious difficulty. With the gradual improvement of our own herds nearly every bull calf produced at our stock farms will be the offspring of a superior cow. After retaining the best of these as our own stock bulls the surplus will be sold to mixed farmers. We have already found that from the work point of view the entire animal is as good and as tractable as the castrated animal. If therefore all our surplus young bulls are sold to mixed farmers as working beasts they will be available for the service of the mixed farmer's cows, and most farmers will therefore eventually own one of these bulls or will be able to send his cow to one owned by a neighbouring farmer. In view of this we have decided that of the bull calves which are produced on our stock farms, only those which are decidedly inferior shall be castrated, and we have also decided that working animals purchased from the Fulani shall as far as possible be castrated before being issued to mixed farmers. We shall also continue the practice of sending good bulls to our farm centres and demonstration farms. These will be available for stud purposes on payment of a small service fee.

Feeding of Cows.

19. The work on the improvement of livestock which is being done on the departmental stock farms will serve no useful purpose unless we can also show the farmer how the improvement can be maintained with the means at his disposal. This particularly applies to high yielding cows, for no cow can maintain a high yield unless she is adequately fed and well cared for. Our problem therefore is to ascertain and work out suitable rations which can be supplied by the mixed farmer from crops grown on his own farm.

20. As a result of several years of experimental work we have come to the conclusion that during the dry season when very little grass is available even the dry cows require some 3 lb. of concentrates and 10 lb. of sweet potato tubers per day, while for each gallon of milk produced a further 3 lb. of concentrates and a liberal supply of sweet potato vines are required. The following, which is the ration for a cow giving a gallon of milk per day, is typical of the rations which are fed at Shika during the dry season, and which experience has shown will maintain both the milk yield and the condition of the cows:—

4 lb. Cotton seed.
1 lb. Guinea corn.
1 lb. Dusa (guinea corn bran).
10 lb. Sweet potatoes.
15 lb. Sweet potato vines.

21. Sweet potatoes constitute the most important part of the carbohydrate portion of this ration. The tubers in addition to their high feeding value are succulent and palatable while the vines besides being readily eaten have a very beneficial effect on the yield of milk. The sweet potato has therefore become our most important fodder crop and we are carrying out a very thorough programme of experimental work with this crop. New varieties known to be heavy yielders of both tubers and vines have been introduced from both Sierra Leone and Barbados, and experiments to test the best time of planting for both tuber and vine production are being carried out. Experiments have already shown that the sweet potato

produces by far the greatest quantity of feeding matter as judged by the weight of starch equivalent per acre of any of the foods which we have so far tried. Unfortunately the vines are usually finished by the end of January and the tubers are often exhausted before the end of March. Time of planting experiments have shown how the vines can be made to continue their growth further into the dry season, but there is still a gap between the end of the sweet potato crop and the flush of new grass which comes with the commencement of the rains. Also although the sweet potato has been so successful in Zaria and at Kano, it does not do equally well in the drier areas such as Daura and Sokoto. It is hoped that cassava will prove to be the solution of these problems and the value of cassava as a foodstuff is now being tested on all farms. We are also investigating the possibilities of spineless cactus, which may prove to be a very valuable fodder crop in the drier areas.

22. Among other fodder crops which are being tested, " Teff grass " sown after millet has given very promising results at Kano. Although it was not sown until after the millet had been harvested and the rains ended early in October, it produced 2,172 lb. of excellent hay per acre. It will now be further tested at Daura and Sokoto. Fodder millets from India, drought resistant wild canes and the Uba cane from the West Indies have recently been introduced and will be fully tested as soon as possible.

23. The provision of an adequate quantity of protein to balance the ration has proved a difficult problem which has not yet been completely solved. The ration quoted above largely depends upon the use of cotton seed for the supply of protein and this is not usually available to the ordinary farmer as all cotton seed surplus to requirements for sowing is exported by the firms. It may in the future become necessary to prevent the loss to the country of such a valuable feeding stuff but in the meantime we are experimenting with both green gram and the pigeon pea as a source of protein. An experiment carried out at both Samaru and Kano with pigeon peas and green gram has given most promising results. At both stations pigeon peas as a sole crop were tested against green gram alone and green gram inter-planted in pigeon peas. The results of the Samaru experiment were as follows:—

Average yield of plots green gram and pigeon peas							763	lb.	grain	per acre.
,,	,,	,,	,,	pigeon peas alone	...	...	586	,,	,,	,, ,,
,,	,,	,,	,,	green gram alone	...	...	312	,,	,,	,, ,,

A yield of 763 lb. of seed suitable for feeding purposes from a leguminous crop is considerably greater than we have ever obtained from any other type of legume. The average yield of cowpeas is not more than 200 lb. per acre, under the very best of conditions. It is interesting to note that the green gram does not seriously depress the yield of the pigeon peas as it usually does with most crops with which it is interplanted. In addition to the grain the leaves and stems of both plants are also useful for fodder. This combination was equally successful at Kano and may prove to be the solution of our difficulty. In addition to its value as a foodstuff the pigeon pea is also useful for its effect on the soil. It has been proved in other countries that its deep root system can successfully break a pan, and experiments in the Benue Province have shown that it is very little inferior to mucuna as a green manure. Improved varieties are being introduced from both India and Trinidad. It will be noted that this work with sweet potatoes and pigeon peas is important from the point of view of human nutrition, for both are valuable foodstuffs and both would be useful in years of low rainfall when the guinea corn harvest seemed likely to be a failure for

they can be planted late in the season and will still give a fair yield. Pigeon peas, except in the extremely dry areas will keep green and continue flowering throughout the dry season.

Silage.

24. In recent years we have carried out a very thorough programme of experimental work to investigate the value of silage. As silage can be made during the rains when the feeding value of grass is high, and when cultivated crops such as maize, guinea corn and green gram, etc., cannot be made into hay it seemed at one time that it might prove to be the solution of our difficulty in finding a succulent fodder during the dry season. We have found no serious difficulty in making excellent silage from the above mentioned plants by the simple pit method, or by utilising an ordinary mud hut as a silo, but the process involves an excessive amount of labour and there is the very serious loss of some 35% of the total nutrients. There is also a serious loss of phosphate, which in view of the comparatively small quantity present in any of our crops, can ill be afforded. We have therefore come to the conclusion that while silage may be useful for special purposes on our own farms it cannot be recommended to the farmer, and we have therefore ceased our investigations on it for the present at any rate.

Chemical Investigation on Manurial Problems.

25. In the Annual Report for 1931 (paragraph 39) reference was made to our attempt to ascertain the reason for the remarkably great effect of farm yard manure on guinea corn at Zaria. At that time Mr. Faulkner reported that " the effect is not due to the direct manurial value of the nitrogen and phosphate contained in the manure." Since then the investigation has been steadily carried on and subsequent results have shown conclusively that we were misled by the ineffectiveness of rock phosphate even when finely ground. In our early experiments rock phosphate was the only phosphatic manure used but subsequent to 1931 we have experimented with super-phosphate and steamed bone flour.

26. The use of a phosphatic manure in which the phosphorus is in a readily available form has completely changed our ideas and it is now clear that at Zaria lack of phosphorus is the primary limiting factor in crop production and that the effect of small dressings of farm yard manure is mainly due to the phosphorus contained in the manure. Our experiments have shown that a dressing of superphosphate containing an amount of phosphate equal to that in farm yard manure will produce a similar increase in yield. Inorganic nitrogen while causing some increase in vegetative growth causes no increase in the yield of grain and potash has so far had no effect whatever. Doubling the dressing of phosphate does not however double the increase in yield; this is only attained when nitrogen is added. Phosphate added to farm yard manure however invariably increases the yield of the latter.

27. So far these experiments have been restricted to Zaria, but we hope in due course to repeat them at Kano where the soil is much poorer in organic matter and where the effect of phosphate alone may be quite different. Important as these results are from the theoretical point of view it yet remains to be seen whether they are of economic value and whether they will help us to provide the farmer with a more adequate supply of manure. This of course depends upon the price at which readily available phosphatic manures can be delivered in Northern Nigeria and the price which

the farmer receives for his crops. As rock phosphate is found locally and can therefore be produced comparatively cheaply it is unfortunate that it is so ineffective. But experiments are now being conducted to ascertain whether its availability is increased if it is incorporated with farm yard manure when the latter is being made in the pen.

Value of Farm Yard Manure.

28. It cannot be stated too often that the introduction of ploughing without manuring will do more harm than good. Year after year our experimental work continues to show that the surest means of increasing the production of all crops is to increase the supply of manure available to the farmer. At each of our farms we have a series of permanent demonstration plots for each crop, half of which are manured the other half being unmanured. At the older stations these are now becoming extremely interesting. The Kano results may be quoted as an example but similar results have been obtained at Samaru and Daura. At Kano the manured plots receive a dressing of three tons of manure per acre.

Guinea corn.

Average yield in lb. per acre of threshed grain.

	1931.	1932.	1933.	1934.	1935.	1936.
6 unmanured plots	709	153	607	575	320	372
6 plots manured at 3 tons per acre	961	266	1,321	1,196	1,181	1,216
Difference...	+252	+113	+714	+621	+861	+844
Percentage increase of manured over unmanured plots...	35·5	73·9	117·6	108	269·1	226·9

Groundnuts.

Average yield in lb. per acre of decorticated nuts.

	1931.	1932.	1933.	1934.	1935.	1936.
6 unmanured plots	964	1,027	925	843	774	873
6 plots manured at 3 tons per acre	1,004	1,209	1,108	1,266	1,137	1,241
Difference...	+40	+182	+183	+423	+363	+368
Percentage increase of manured over unmanured plots...	4·1	17·7	19·8	50·2	46·9	42·2

Cotton.

Average yield in lb. per acre of seed cotton.

	1931.	1932.	1933.	1934.	1935.	1936.
6 unmanured plots	...	...	188	191	127	60
6 plots manured at 3 tons per acre	...	...	320	287	284	167
Difference...	...	...	+132	+96	+157	+107
Percentage increase of manured over unmanured plots...	...	...	70·2	50·3	123·6	178·3

29. These results indicate that allowing for seasonal variations a dressing of three tons of manure per acre every year at Kano is more than maintaining the level of fertility. They also show very clearly that this soil loses fertility very rapidly indeed if it is cropped continuously, especially with grain crops, and is not manured. The fall in the yield of groundnuts is not nearly as rapid as that of either guinea corn or cotton, and these results justify the argument that where groundnuts can be grown the mixed farmer can safely cultivate a much greater area with his available supply of manure than where the export crop is cotton or guinea corn. But even with groundnuts the difference between the yield of the manured and unmanured plots is steadily widening, being now about 350 lb. per acre, which with the price of groundnuts at £8 per ton is worth £1 5s. 0d. There must be considerable areas of groundnut and cotton land at a much lower level of fertility than our unmanured plots and the production of both groundnuts and cotton would be greatly increased if such areas could be regularly manured.

30. One obvious method of increasing the supply of manure is to ensure that none of it is wasted in the bush, *i.e.*, by keeping the cattle entirely on the farm. A system by which this can be done is gradually being worked out at Maigana, and the quantity of extra manure thus conserved is quite considerable. As it involves bringing food to the cattle during the rains it introduces problems such as the making of enclosures, live fences and improvement of grassland and is therefore not entirely a simple matter. But it is a development which must come eventually especially when the farmer owns a valuable cow, for in addition to providing extra manure it will assist greatly in protecting the animals from tsetse fly. We regard it as an important matter and every aspect of it is being carefully studied.

Goats and Donkeys.

31. The problem of increasing the supply of manure inevitably led us to investigate whether more use could not be made of small stock, *i.e.*, goats and sheep for this purpose. Attention was drawn to this matter by the Colonial Advisory Council of Agriculture and Animal Health and the following extract is quoted from their report on " The Allocation of Work between Colonial Agriculture and Animal Health Services " which was published in 1933. " In the majority of Colonies little use has so far been made of such stock (sheep and goats) for the manuring of cultivated lands; in India such stock are regularly folded on agricultural lands for manuring against the next crop ". Preliminary work on this has been going on at Kano for three or four years. In 1934 we laid out a five-acre farm there and stocked it with a herd of goats and three donkeys. The donkeys have quite successfully carried out all the cultivations on this farm, and fertility has been maintained by the manure produced by both goats and donkeys, while the goats have in addition provided both milk and skins. The work so far has been encouraging but there is still a good deal to be done. Losses are too heavy in the wet season and we have not yet ascertained how best to provide food for the goats when they are kept on the farm entirely and not allowed to wander at all.

32. As a result of two or three years experimental work at Sokoto and Birnin Kebbi this work however began to assume much greater importance. In the drier and more remote parts of Sokoto our present system of mixed farming is not suited to local conditions. The soil is so light and so poor that it is not possible to obtain

a yield of groundnuts anything like comparable with the yields obtained at Kano. The best yield obtained at Sokoto on well manured land has been 654 lb. per acre, but the average yield is only from 350 to 400 lb. per acre. As the soil is quite unsuitable for Allen cotton the farmers in these areas have no direct export crop, so that even if they were provided with a minimum advance with which to procure cattle and implements they would have great difficulty in finding the money to repay the loan. Also unless a farmer can keep other stock for the production of manure the use of bullocks for ploughing is not economic; for on this light soil a pair of bullocks can easily cultivate some twenty acres whereas the manure produced is only adequate for some two or three acres, as on such soil comparatively heavy dressings are required.

33. The only solution seemed to be to either increase the number of cows kept by each farmer or to try to make more use of goats as both manure makers and a source of revenue. At this stage cows are quite out of the question for the bulk of the farmers whereas goats are cheap and are easily obtained. There is another reason for making more use of goats in the Sokoto Province. The Sokoto red goat possesses a very valuable skin, and in order to protect the skin the Veterinary Department has started a campaign for castrating all billy goats which are not true to type. It therefore seems well worth while to make some attempt to increase the number of these goats and also to produce pedigree males which can be handed over to the Veterinary Department for the furtherance of their project. While we are therefore studying the economics of goats on all our farms, we are concentrating on this work at Sokoto and Birnin Kebbi in the hope that we shall be able to evolve a system of mixed farming based on the keeping of goats which will be suitable for such areas. Our experience to date shows that a herd of twenty goats will produce approximately the same quantity of manure as a pair of bullocks and that on these light soils donkeys are capable of doing all the cultivation.

34. If we attempt to increase the number of goats we shall do more harm than good unless we can find some means by which they can be kept entirely on the farm, for it has been proved in other countries that unrestricted grazing by goats leads to the destruction of natural vegetation and consequently increased erosion. Whether we shall be able to work out a system which will achieve this, or whether when goats are so kept losses will be excessive remains to be seen, and we should be unwise to encourage farmers to increase their herds of goats until we have done so. It seems quite possible that losses will be greatly reduced when the animals are properly fed as they will then have more resistance to disease. It is quite certain that where the population is thick and there is little or no bush they require more food than they can ordinarily find for themselves, and this extra food must be grown on the farm. Also if they are to be kept on the farm a system of fences and enclosures is essential.

35. The whole subject is to be fully investigated, and although it may be some years before the main problems have been solved, if we are successful, the investigation will have far reaching results, for it means that a form of mixed farming will be within the means of the smallest farmer and every farmer, by means of his goats will be able to learn the essentials of animal husbandry and the conservation of manure. It may also prove to be the solution of finding an improved form of agriculture for the areas

in the extreme North where wind erosion is more or less serious, for it is obvious that the proper use of goats will involve the use of enclosures and fences.

36. The use of donkeys for cultivation is a useful adjunct to goat farming. They will be useful to farmers who have five or six acres of land available, as farms of this size are too big to be effectively cultivated by hand and too small to justify the use of bullocks. Where farms are bigger than this bullocks are to be preferred owing to the increased quantity of manure which they can produce. The management and feeding of donkeys will therefore be studied, and this may in time lead us to make some attempt to improve the local breed.

Demonstration Farms.

37. The demonstration farms continue to justify themselves both as a means of demonstrating our system of mixed farming and such other improvements as we wish to introduce and as a means by which we are enabled to study the best method of adapting our results to local conditions. That such a study is necessary is shown by the fact that the system which we worked out for the Gusau area and which is being demonstrated there was not entirely a success on the demonstration farm at Kaura Namoda some eighty miles away, and experience has shown that in order to adapt it to that area certain details need to be modified. This example once again shows how very thoroughly every new system and improvement must be tested before it can be recommended to the peasant farmer.

Improvement of Live Stock.

38. The table given below shows the progress made in improving the yields of the milking cattle in the three herds at Shika and Samaru. The method of presentation of these figures was explained in last year's report:—

Year	Number of complete lactations.	Average period between calves—days.	Average number of days in milk.	Average yield per day between calves—Pounds per day.
		Shuwa Herd.		
1929	11	419	250	4·78
1930	16	413	264	3·71
1931	10	398	198	3·63
1932*	15	404	250	4·85
1933	26	471	250	4·35
1934	40	410	290	5·08
1935	45	389	296	5·86
1936	52	372	262	5·39
		White Fulani Herd.		
1930	3	391	168	2·02
1931	10	371	172	3·97
1932	18	492	230	3·52
1933	45	427	213	3·79
1934	42	406	261	4·76
1935	47	363	278	6·52
1936	58	352	227	6·25
		Gudali (Sokoto) Herd.		
1933	3	—	—	2·42
1934	11	541	288	3·81
1935	19	369	235	5·72
1936	25	373	245	6·29

* A number of Shuwa cows were purchased and added to the herd in 1932.

The comprehensive figures given above for the White Fulani and Shuwa herds for 1936 indicate that there has been a slight set back in the rate of improvement. This however is entirely

misleading because the figure for 1936 includes a high proportion of heifers in their first lactation and if the yields of the latter were corrected to the equivalent lactations of the purchased stock their performances would be greatly in advance of them. Further satisfaction is derived from the good promise shown by most of the home-bred heifers some of whose first lactation records are given below:—

No.	Name.	Breed.	Days in milk.	Lactation yield.	Days between calves.	Yield per day between calves.
				lb.		lb.
131	Gajera ...	W. Fulani ...	279	3,705	334	11·10
72	Kalangu ...	Sokoto ...	300	3,169	328	9·78
66	Ole ...	W. Fulani ...	334	3,519	365	9·61
106	Dudu ...	Shuwa ...	380	3,741	433	8·64
111	Shikaye ...	Shuwa ...	329	3,018	351	8·60
67	Kono ...	Sokoto ...	379	3,010	410	7·34
108	Diyan Sai	Shuwa ...	377	2,803	397	7·06
164	Tringa ...	W. Fulani ...	308	2,471	372	6·64

39. As an example of the capabilities of Nigerian Cows when adequately fed, the following lactation yields may be quoted:—

No.	31	Sokoto	5,805	lb.	in	322	days.
,,	68	Sokoto	5,286	,,	,,	367	,,
,,	49	W. Fulani ...	4,848	,,	,,	298	,,
,,	51	Sokoto	4,059	,,	,,	285	,,
,,	145	W. Fulani ...	4,040	,,	,,	283	,,

While it is anticipated that the number of days in milk will be increased with each new generation, it is worth stressing that in all our herds annual calving is normal.

The Relation between Milk Yield and Body Weight.

40. A careful investigation carried out at Shika has shown that in the White Fulani herd the best milkers have the highest average body-weight and, what is equally important, that the weight of milk produced per cwt. of live-weight by the heaviest animals exceeds that given by the lighter animals. In other words the heavier animals are the more efficient milking machines, and, as was shown at the time, also more economical yielders. The results may be summarised as follows:—

Group.	No. of cows.	Yield P.d.b.c.	Average body-weight.			Average lb. of milk p.d.b.c. per live-cwt.
			Cwt.	Qr.	Lb.	
1	14	Over 8 lb.	7	2	19	1·19
2	22	Between 7 & 8 lb. ...	7	0	12	0·99
3	11	Between 5 & 6 lb. ...	7	0	1	0·79

p.d.b.c.= per day between calves.

A complementary investigation showed that too early calving reduced the birth-weight of the offspring and very often so reduced the heifer's first lactation that it was useless as a measure of her capacity.

41. These results are important for they have provided us with a definite character, namely size, at which we must aim in order to attain our main object which is the improvement of Nigerian

cattle for milk yield. A secondary object of our breeding policy is to produce male beasts which are also good workers. Generally speaking our best workers are the heaviest animals so that in the case of the White Fulani breed there is nothing antagonistic in the attempt to combine milk production in the cows with working ability in the males. These results have also provided information with regard to a factor which tends to limit the expression of this desirable character. Previously with the object of getting quick results with which to judge the transmitting powers of the bulls, heifers were permitted to breed whenever they were sexually mature. As a result of good feeding sexual maturity now occurs in our herds at a comparatively early age before the heifers are nearly fully grown. It has now been shown that it pays to postpone services until the heifers are over $2\frac{1}{2}$ years of age, for this results in a greater birth weight of the calves and makes the subsequent lactation of the animal a truer reflection of her capabilities.

Mineral Sufficiency.

42. Some years ago, experiments carried out at Shika with the original purchased stock, showed that the feeding of minerals other than native cattle licks and common salt, exercised no influence on weight-increase, sexual maturity, or general condition. At that time we asked very little of our cattle; but nowadays when the rate of breeding has been speeded up, milk yields doubled, and in fact the complete machinery of metabolism and reproduction accelerated, it seems desirable that the effect of a more complete mineral ration should be investigated. Accordingly a new mineral experiment has been started and the effect of complete minerals will be tested from the birth of the heifer calf until she completes her first lactation.

Calf Mortality.

43. The following table gives the position with regard to calf mortality at both Samaru and Shika since 1927 and 1931 respectively:—

Year.	At Samaru Farm.		At Shika Farm.	
	For all births and abortions—per cent.	For live births only—per cent.	For all births and abortions—per cent.	For live births only—per cent.
1927	17	17	...	...
1928	21	15	...	...
1929	30	30	...	...
1930	30	26	...	...
1931	44	38	52	48
1932	49	41	46	41
1933	23	16	36	34
1934	29	23	13	10·5
1935	18	8·2	11	6·9
1936	13·3	9·3	13·7	10·4

The improvement at Samaru is eminently satisfactory and calf mortality has now been reduced to a very reasonable level at both farms although we shall continue to make every effort to reduce it still further. There were only three losses due to abortions at Samaru in 1936. This figure is the lowest since 1930.

American Cotton in the Northern Provinces.

44. Purchases of American seed cotton for export since 1925-26 expressed as bales of lint each of 400 lb. net are as follows:—

	Seed distributed.	Cotton bought.	Price paid per lb. of seed-cotton.
	Tons.	Bales.	
1925–26	2,990	37,356	$2\frac{1}{2}$d.
1926–27	3,372	16,659	$1\frac{1}{8}$d.–$1\frac{3}{4}$d.
1927–28	2,220	16,316	$2\frac{3}{8}$d.–$2\frac{1}{8}$d.
1928–29	2,640	24,686	$2\frac{1}{4}$d.–$2\frac{1}{8}$d.
1929–30	3,173	34,389	1·6d.–1·2d.
1930–31	2,719	13,849	·5d.–·8d.
1931–32	1,569	4,811	·6d.–·8d.
1932–33	1,674	22,228	·8d., ·9d., ·8d.
1933–34	2,376	23,013	·8d.–1·2d.
1934–35	3,807	50,022	1·1d.–1·5d.
1935–36	5,170	49,793	1·1d.–1·6d.
1936–37	5,327	39,887*	·8d.–1·5d.

* Estimated.

45. The purchases last season to March 31st were only 39,887 bales so that the final figure is unlikely to exceed 41,000 bales. This result is disappointing in view of the fact that a record quantity of seed was taken from the dumps. In the Zaria Province yields were above average and this is reflected in an increase in the total purchases. Elsewhere lack of late rains and a very severe harmattan resulted in yields which were below average. But low yields do not account for the whole of the decrease. The groundnut crop was a record one and there is no doubt that in some areas groundnuts were grown at the expense of cotton. This particularly applies to the Kano Province where the area under cotton last season was very small indeed, with the result that the cotton required for the local weaving industry was drawn from the areas which normally produce for export. The low price paid by the firms in the Northern areas also encouraged purchases by the local industry. If as is usually assumed the local industry absorbs some 10,000 bales, and much of this quantity was drawn from areas which normally produce for export this accounts for a substantial part of the decrease. The high price paid for last season's groundnut crop will undoubtedly cause a still further increase in the area under this crop next season, and it is probable that some of the increase will again be at the expense of the cotton crop, although so far the demand for cotton seed has been satisfactory.

Improvement of American Cotton.

46. Further trials with D. 31 on all our farms have again demonstrated that it yields from 25% to 30% more than the ordinary type, and it has again given a ginning percentage of 35.78% as against 31.5% for the commercial crop, but unfortunately a preliminary report on a small sample confirms that it is lacking in strength. No decision as to whether it shall be distributed to farmers has yet been made. It was multiplied at Daudawa this year and the resulting crop consisting of some forty-nine bales will be sent to England and distributed among as many spinners as possible. We hope by this means to ascertain its true commercial value, or whether it has a special value for any particular purpose. Meanwhile there are several other promising strains which are under trial. E. 31 is only a little inferior to D. 31 in yielding capacity, is superior in lint quality, and is also very disease resistant. Its one defect is that it has a tendency to produce a certain amount of dead cotton at the tip of each boll, thus causing an excessive amount of waste in the process of spinning. Many re-selections of D. 31 have been made in the hope of finding one which produces

lint of better quality while still retaining the high yield, while another locally selected strain which seems promising, as well as several introduced varieties are being tested. Arrangements have also been made for the introduction of two new strains which appear to have been successful in Uganda.

Improvement of Guinea Corn.

47. Our plant breeding work is not confined entirely to the improvement of export crops. Mention has already been made of the introduction of improved varieties of sweet potatoes and pigeon peas. A good deal of work has also been done in recent years on the improvement of guinea corn, from the point of view of yield. Some success has been achieved. Strain F.B. which was selected by the Botanists a few years ago, although not outstandingly superior is very popular with the farmers. But there have been many disappointments. There are so many local strains of guinea corn that one of the first difficulties was to select a suitable standard against which to test the selected strains. This difficulty has now been overcome, but the results are still very variable. A strain which is really superior in one season may be no better or even inferior to the standard in another season or even on different farms. As the increases have often been in the order of 20% to 30% they cannot be due to experimental errors. It is hoped that it will shortly be possible to make a special study of the causes of these variations.

Grasses.

48. In the 1932 report brief mention was made of the work on local grasses which was being done by both the Botanist and the Chemists. The Botanist has collected and grown a very great number of local grasses in recent years and they have all been analysed by the Chemist. As a result of this work we have come to the conclusion that three or four species are likely to be of real value to the farmer when the time comes for him to adopt the system of keeping his animals in paddocks. One of these, "Gamba" (*Andropogon Gayanus var. signamulatus Stapf.*) is a particularly valuable grass and is well worth further study. It has an excellent analysis, is extremely palatable to cattle and has the great advantage that it remains green throughout the dry season. It makes very little growth during this period, but it shoots away with extreme rapidity when the first rains come and provides an early bite which is very useful indeed. Plots of this grass are being established at all our farms and its further possibilities from the mixed farmers point of view are being investigated. Several varieties of grasses have been introduced from other countries but they have not yet been fully tested.

Ginger Production for Export.

49. For the first time since the export of ginger commenced in 1931 the purchases for the season have failed to exceed those of the previous season. The following figures show the progress of the industry since its commencement:—

1930-31	... ...	15 tons.
1931-32	... ...	39 ,,
1932-33	... ...	53 ,,
1933-34	... ...	86 ,,
1934-35	... ...	221 ,,
1935-36	... ...	378 ,,
1936-37	... ...	342 ,,

50. Although it is a little disappointing to have to record this slight setback in the rate of progress, from other points of view the season was very satisfactory. Owing to a small increase in the price paid for Grade II ginger the total amount paid to the producers was greater than in 1935-36 being £8,601 as compared with £8,456. There was also a very marked improvement in the quality of the ginger especially in the older areas.

51. Experience in previous seasons has shown that Grades I and II were redundant, the really high quality ginger produced being insufficient to justify their retention. A change in grading was therefore introduced. The former Grade III which formed the bulk of the crop was made the standard grade and was renamed Grade I, while Grade IV became Grade II. But in order not to discourage the preparation of high grade ginger any ginger better than Grade II was purchased as Special Grade. The grading of the crop in the last four years has been as follows expressed as percentages of the whole:—

	Grade II.	*Grade III.*	*Grade IV.*
1933-34	2	92	5
1934-35	5	77	17
1935-36	2	64	33
	Special.	*Grade I.*	*Grade II.*
1936-37	1	72	27

52. These figures hardly give a true picture of the improvement which has taken place. Of the ninety-two tons purchased in the opening market at Katchia only five tons were Grade II which shows that the people now fully understand the standard which is required. The subsequent falling off in quality was due to the fact that the producers having acquired sufficient money for their needs did not take the same amount of trouble with the remainder of their crop. Also a period of damp weather about this time made conditions which were unfavourable for producing the requisite colour. The improvement in boldness is most encouraging for it means that the people are making a real attempt to cultivate and manure their ginger. It is interesting to note that in the Jaba tribe every adult male now owns a ginger farm and that the proceeds of the crop worked out at 39s. per grower. Further extension work in the Jaba area will therefore be devoted to improvement in cultural methods and quality.

53. The prices paid this season and in the previous seasons were as follows in pence per pound:—

	Grade II.	*Grade III.*	*Grade IV.*
1934-35	$3\frac{1}{2}$	$2\frac{5}{8}$	$1\frac{1}{2}$
1935-36	$3\frac{1}{2}$	3	$1\frac{1}{2}$
	Special.	*Grade I.*	*Grade II.*
1936-37	$4\frac{1}{2}$	3	2

Three firms again competed in buying the crop. Before the season commenced draft regulations for regulating the marketing of ginger had been prepared but as we wished to gain further experience before actually introducing them the firms all agreed to conform to them. On the whole the promise was well kept and very valuable experience as to their working was thus gained.

54. During the 1935-36 season we discovered a new type of ginger which is yellower in colour than the ordinary ginger and is much more easily prepared. Samples of this ginger sent to the Imperial Institute were very favourably reported on, and every

effort is now being made to multiply it as rapidly as possible in order that seed can be distributed to the producers. In the meantime the distribution of the seed of improved strains of the ordinary type is being continued. The villagers have been quick to realise the value of this improved seed.

Cattle for the Middle Belt.

55. Our reasons for proposing to attempt to work out a system of mixed farming for the middle belt based on West African Shorthorn cattle were explained at length in last year's report and mention was made of schemes for testing the suitability of these cattle under varying conditions, with the possibility of establishing a stock farm on a large scale at a later date. In order to enable this work to be tackled seriously a free grant of £3,400 to meet the cost of capital outlay has been received from the Colonial Development Fund and the Nigerian Government has agreed to meet the recurrent cost which is estimated at approximately £1,400 per annum. As these are comparatively large sums to spend on what at this stage must be regarded as a long range experiment it seems desirable to review our knowledge and state briefly our proposals for carrying out the work.

56. The West African Shorthorns which we introduced from the Gold Coast two years ago have now been worked regularly for more than a year and they have been particularly healthy from the point of view of trypanosomiasis. The cows are breeding regularly and the calves thrive remarkably well. We therefore conclude that they have a high degree of resistance to trypanosome infection. When they were first introduced it was argued that while they might be resistant to the strains of trypanosomes found on the Gold Coast they might not be equally resistant to the strains found in Nigeria. Their continued good health seems to indicate that their resistance to the local Ilorin strains is quite satisfactory. It is true that the incidence of tsetse on the Ilorin farm is comparatively low, but it is equally true that Zebu cattle do not thrive there, and blood smears have shown that all the cattle there, and even the calves are actually infected with trypanosomes. But we do not anticipate that even with the West African Shorthorn mixed farming which includes the use of the bulls for purposes of work will be possible everywhere. We may find that in some areas where there is a comparatively low incidence of fly these animals are quite satisfactory, that in others while they can live and thrive they cannot be worked, and that in still others they cannot even thrive. One of our immediate problems therefore is to ascertain the facts in order that we may be in a position to advise farmers what type of mixed farming is possible. For it must be remembered the cattle of the mixed farmer will not be kept under nomadic conditions; it will be our duty to work out a system by which they are kept on the farm and to teach the farmer how they should be fed and cared for. Also mixed farming is possible even if the bulls cannot be worked. There is always a demand for meat in the Southern Provinces and the farm yard manure is always useful for increasing crop production.

57. Our other immediate problems may be stated briefly as follows:—

1. To try to find the best type of West African Shorthorn for the middle belt.
2. To ascertain whether the mild infection which is sustained by calves bred on the farm at Ilorin will enable them to develop resistance.

3. If this resistance is inadequate what degree of infection is required to produce it and at what age.
4. To work out a system of mixed farming suitable for local conditions.

58. In order to deal with these problems we propose to establish a central farm at Ilorin where experimental work can be carried out. In addition we propose to establish a series of small farms each of approximately ten acres scattered over a wide area. These will be chosen as far as possible to provide a wide range of tsetse conditions. The Entomologist is co-operating with the Agricultural Officer in choosing the sites for these farms and he will visit them periodically to ascertain the incidence of tsetse at all times of the year. They will be stocked initially with two bulls, two cows and a calf or yearling. Later on calves born at Ilorin will be transferred to these farms to see what degree of infection they can tolerate. These farms will also enable us to study the economics of mixed farming under conditions suitable for the peasant farmer and to ascertain the value of farm yard manure, and to find out the best system for each locality.

59. We propose also to introduce cattle from the Gambia, to make further introductions from the Gold Coast and Dahomey, and to test the local Ketaku breed. In addition we hope to be able to obtain a small herd of the Malinke breed from French Guinea, as this breed is reported to be superior both in conformation and resistance to trypanosomes to any of the other types. The importance of this work can hardly be exaggerated for if it is successful the results will undoubtedly be applicable to many parts of the Southern Provinces where the need for animal products and for manure is very great. Even on the poor acid soils of Umuahia farm yard manure has given most striking results and if it was available in quantity it would solve the problem of soil fertility in that area very quickly. Quick results are not anticipated but there is every hope that the experiment will produce beneficial results eventually. Success largely depends on close co-operation with both the Veterinary and Tsetse Investigation Departments and I gratefully acknowledge the assistance and advice which we have already received from them.

The Benue Province.

60. The benniseed crop reached the record figure of 13,000 tons, and as the price was between £7 and £8 per ton as compared with £4 13s. 4d. last year, the farmers had a very prosperous season. But the position is not entirely satisfactory. In many parts there is a real land hunger which in turn means that the period of fallow is becoming steadily reduced. Also the country is steadily becoming de-forested and instead of fallows consisting of secondary bush, in large areas the fallows consist almost entirely of spear grass (*Imperata cylindrica*) which is very difficult to eradicate when the land again comes under cultivation.

61. A system of rotational green manuring suitable for local conditions has been worked out at Yandev, and we have proved that it adequately maintains fertility. That it is also economically sound is shown by the results obtained from the demonstration farms, but it has not yet proved acceptable to the Tiv farmers, chiefly because it involves more work for the male members of the community. Our system is based on the use of Mucuna as the green manure crop and of all the crops which we have tested it undoubtedly gives the best results from the point of view of maintaining fertility. Also if it receives some preliminary

cultivation and weeding in the early stages and is thus enabled to make a good start it can successfully compete with spear grass. But as the Tiv are usually not prepared to give this small amount of extra cultivation, when the system has been tried on Native farms the growth of the Mucuna has almost invariably been adversely affected by the grass. We are therefore attempting to work out a simpler system which involves very little extra labour. The Tiv rotation almost invariably ends with a crop of benniseed after which the land is allowed to revert to bush. We are now investigating the possibility of growing a woody leguminous plant such as pigeon pea, *Tephrosia candida* or *Cassia siamea* through the benniseed with the object of leaving the legume on the land after the benniseed is harvested. Results have so far been encouraging. *Tephrosia candida* seed broadcast through the benniseed germinated satisfactorily and in spite of the competition of the benniseed grew sufficiently well to give a very fair cover when the latter was removed. In the case of pigeon peas the growth was so rapid that the yield of benniseed was depressed but this can probably be overcome by later sowing. Both plants when fully grown can effectively check the growth of spear grass.

62. Dwarf cattle and small stock are found in most hamlets and our experiments have shown that the manure which they produce if properly conserved is very valuable; and even if the quantity is small it would be useful for the minor crops which are grown around the compounds. But it will undoubtedly take us a long time to teach the Tiv to value their stock for the manure which they produce. Their attitude towards the keeping of livestock is indicated by the fact that no less than eight cattle and forty-six sheep and goats were slaughtered in one comparatively small village for a ceremonial dance.

63. The real obstacle to improved agricultural methods in the Tiv area is the reluctance of the men to increase their share of farm work. The women cannot undertake to do more than they already do. In co-operation with Administrative Officers a real attempt is now being made to change this attitude, and an area of some 4,000 acres containing three family groups comprising seventy-three hamlets was selected for intensive propaganda. In this area every house-holder was expected adequately to weed and thin his benniseed and guinea corn and the work was supervised by the Agricultural Officer and his staff. Yield figures from farms taken at random indicate that this simple process has increased the yield of benniseed on these farms by from 80% to 100% and the people are very pleased with the result. Such is their mentality however, that unless continued supervision can be given they will very quickly revert to their old ways.

Ishan Cotton Production.

64. The purchases of Improved Ishan Cotton for export in recent years are given in the following table:—

	Native Cotton.		Improved Ishan.	
	Bales of 400 lb. lint.	Prices	Bales of 400 lb. lint.	Prices.
1929–30	3,510	1¼d. falling to ⅝d. (2)	6,026	1⅜d. falling to ⅞d. (1)
1930–31	312	⅝d. falling to ⅜d. (2)	4,289	¾d. falling to ⅜d. (1)
1931–32	4	¼d. falling to ⅛d. (3)	1,333	½d. falling to ⅜d. (3)
1932–33	4	Not quoted	860	9/16d. falling to ⅜d. (3)
1933–34	118	⅝d. (3)	2,884	¾d. (3)
1934–35	389	⅝d. (3)	5,208	1⅛d. falling to ¾d. (3)
1935–36	444	¾d. rising to 13/16 (3)	8,132	1d. rising to 1 3/16d. (3)

Figures in brackets refer to the Grade.

65. The 1935-36 cotton crop in the Southern Provinces amounted to 8,132 bales and was the biggest since Improved Ishan cotton was introduced. Unfortunately extremely dry weather during the planting season adversely affected the 1936-37 crop and it is unlikely that the total for the season will exceed 5,800 bales. This figure is, however, considerably greater than at one time seemed likely, and it is particularly satisfactory that cotton production has been maintained in spite of the high price of cocoa.

66. During the depression period we were obliged to relax our supervision of the Meko Multiplication area with the result that the quantity of selected seed from that area became insufficient to meet the demand and we were obliged to distribute inferior seed. As a result there has been a falling off in the quality of the commercial crop owing to the presence of an increasing quantity of native seed. This year with the co-operation of the British Cotton Growing Association special steps were taken to re-awaken enthusiasm for cotton growing in the Meko area. These included better marketing facilities, a bonus on seed production, and an increased price. Selected seed was also distributed through Co-operative Societies in other areas and the latter made arrangements to segregate the seed cotton produced from this seed. These measures have had the desired effect and for the forthcoming season there should be a greatly increased supply of pure seed. In the Meko area 4,716 lb. of seed were distributed and the resulting crop amounted to 198,223 lb. of seed cotton giving a record multiplication rate of approximately twenty-five times. The value of the Co-operative Societies in other areas as a medium for extension work of this nature was also clearly demonstrated. Not only was the rate of multiplication very satisfactory but 22% of the resulting seed cotton was either Grade I or Grade II, which is a great improvement as compared with the ordinary commercial crop in which only 5% of the total was included in Grades I and II.

Green Manuring in the Western Provinces.

67. Extension work on the maintenance of fertility by the use of green manures in the Ogbomosho area although on a very small scale is proceeding satisfactorily. Thirty-seven farmers in this district laid down small farms to be cropped on a three year rotation including green manures according to our advice. In spite of an abnormally dry year satisfactory covers of both Mucuna and Popondo were obtained and there is every prospect that the effect of these covers will be reflected in this season's crops. An interesting development is the fact that the farmers having decided to make use of green manures are prepared to grow them purely for their manurial value. Popondo did not make as much growth and consequently did not form such a good cover as Mucuna with the result that this year all the farmers wish to plant the latter in spite of the fact that Popondo produces an edible bean. There is a good deal of enthusiasm for green manuring in the Ogbomosho and surrounding districts and if the results from these first few farms come up to expectation rapid progress in the near future is quite likely.

Maintenance of Fertility, Eastern Provinces.

68. Although we have tried almost every plant suitable for green manuring known to tropical agriculture, it cannot be said that we have yet succeeded in working out a system of permanent farming by means of green manures which is entirely successful on the acid sandy soils of the Eastern Provinces. The importance of this work can hardly be overestimated. It is not merely a question

of safeguarding the food supply for a very dense population; it is also of great importance in connection with palm planting for in the most thickly populated areas land can only be made available for planting palms at the expense of food crops. We cannot therefore anticipate any extension of palm planting on a big scale in such areas, unless we can show that the area required for food crops can be reduced or that more land can be made available. This can be effected in three ways namely:—

(*a*) by a system of permanent cultivation,

(*b*) by reducing the period during which land must remain under bush fallow, and

(*c*) by bringing back into cultivation land which has been so overcropped and eroded that it is now valueless, for either food crops or palms.

69. As a result of our many trials we had great hopes that the problem of permanent cultivation could be solved by the use of Calopogonium as a green manure. But last season's experiments indicated that there is some doubt as to whether Calopogonium is really more efficient for maintaining fertility than, say a cover of weeds. It has been quite definitely established that the land must be kept covered with some form of plant growth—land which is exposed to sun and rain can be reduced below the cropping level in two or three months—but unless Calopogonium can maintain a higher level of fertility than weed growth it is obviously uneconomic to grow it. On some soils however it seems to be quite effective but we are not yet in a position to account for this difference in its behaviour. As it still seems a hopeful line we propose to persevere with it until its value or otherwise is definitely established, but we cannot commence any form of extension work with it at present.

70. In other directions genuine progress has been made. We have definitely established that even on farm land so washed that it has had to be abandoned by the local farmers fertility can be restored to the cropping level (*i.e.*, to the stage at which yams can be grown) by the systematic planting of the local shrub *Acioa Barteri* (Ibo: Araba, Oka, Icheku), and allowing it to remain on the land for from five to six years. The value of this shrub is already realised by the local farmers, but it is not yet planted systematically on a large scale. We have still much to learn about how to make the most effective use of it and how long it must be left on the land to restore fertility completely, but our experience to date indicates that except on the most infertile soils it will effect a definite improvement. *Tephrosia candida* gives equally good results on all but the very poorest soils, and where it will grow successfully there are indications that it has the advantage that it will restore land to the cropping level more quickly than " Araba " will do. On our farm at Umuahia a piece of land which had been badly washed and had dropped below the level at which it was possible to carry any sort of crop is now carrying an excellent crop of maize as a result of a three years fallow under *Tephrosia*. As there are considerable areas in both the Onitsha and Owerri Provinces which are now only capable of carrying a thin cover of poor grass, and which could be made into productive farm land by the use of one or other of these plants these results represent real progress and are being followed up.

71. Applications of small dressings of lime, and of rock phosphate, have given beneficial results but the results are not sufficiently striking even on the best land to justify our advocating their use. The value of artificial manures is being fully investigated by the Chemist by means of field, pot and laboratory experiments for

they may yet prove to be a useful adjunct to green manuring. We are now testing the effect of complete dressings of artificials and of both basic slag and superphosphate on limed and unlimed land.

72. An outstanding feature of our experimental work at Umuahia has been the surprisingly good results given by dressings of farm yard manure even on very poor land. The results of one typical experiment which was carried out last season were as follows:—

Effect of Farm yard manure on Yams.	*Average yield per acre.*
Control plots	3,007 lb.
Plots manured with 4 tons sheep manure per acre	5,208 ,,
Plots manured with 4 tons pig manure per acre	7,407 ,,

A dressing of 4 tons per acre of pig manure more than doubled the yield of yams and a similar dressing of the less concentrated sheep manure also gave a very striking increase in yield. The plots were not manured this year as we wish to test the residual value of the manure applied last year. The appearance of a following test crop of maize planted this year indicates however that even the heaviest dressings give very little residual effect, but we already have definite evidence that permanent farming would be possible on these soils if an adequate supply of farm yard manure was available. While it is too much to hope that we shall reach such a stage in the near future it is also clear that much more use could be made of the domestic animals, dwarf cattle, sheep, goats and pigs which do exist in these areas. These very satisfactory results with farm yard manure, taken in conjunction with the great demand for all forms of meat by the people of the Eastern Provinces justify an intensification of our work with stock at both Umuahia and Onitsha. We already have small herds of dwarf cattle, sheep and pigs at Umuahia, and in addition to our study of the effect of farm yard manure, we are also investigating compost making and the problem of how to adapt the keeping of stock to the local system of agriculture. Our experiments with pigs have already shown that they can be successfully kept in confinement provided that they are supplied with an adequate quantity of food and minerals. The latter are essential and pigs which are not allowed free range cannot live without them.

Chemical work in connection with the Maintenance of Soil Fertility.

73. The Chemist has co-operated very closely with the work on soil fertility which has been carried out in the Eastern Provinces. He has also been investigating the effect on the soil of burning the green manure as opposed to digging it in green. This is an important investigation because one of the objections to green manuring from the farmers' point of view is the amount of labour involved in the process of digging it in. Experiments to test the best method of treating green manures have been going on continuously for several years at Moor Plantation and one of these is a straight test of burning versus digging in. This experiment has now been in progress for five years. The cropping each year is early maize followed by green manure, and surprisingly, there is as yet no appreciable difference in the yields of maize obtained from both sets of plots. The yields of maize since the commencement of the experiment are as follows:—

B7 and 8.—Burning Mucuna *v.* Digging Mucuna in fresh.

Early maize yields: lb. dry grain per acre.

Treatment.	1932.	1933.	1934.	1935.	1936.
Mucuna dug in fresh ...	1,615	597	1,746	1,689	548
Mucuna burnt (difference)	90	+84	+56	+7	+124
Standard Deviation ...	±103	±31	±66	±85	±87
Result	Not Significant.	Significant.	Not Significant.	Not Significant.	Not Significant.

74. Chemical analysis however shows that very definite changes are taking place in the soil as a result of these treatments. The soil in the plots on which the Mucuna is dug in green contains more organic matter and more total and available nitrogen than the soil of the plots on which the Mucuna is burnt. In the latter the soil is less acid and contains more available mineral nutrients, although the increase in the available phosphate disappears towards the end of the season.

75. The experiment will be continued to see how long fertility will be maintained by simply burning the cover crop. The efficiency of the burning treatment is bound up with the fact, shown by previous work, that the production of available nitrogen in the soil after the early rains under the conditions existing at Moor Plantation is extremely rapid. After five years the amount of available nitrogen in the soil of the burnt plots although not as high as in the plots where the manure is dug in green is still high, and it seems therefore under such conditions the limiting factor in the growth of the crop is the supply of available mineral nutrients. At Yandev in the Benue Province, where the soil is of a similar nature but contains less total and less available nitrogen than that at Moor Plantation the effect of digging in Mucuna is superior to burning it.

Palm Planting.

76. The following figures show the total area of plantations made and maintained by African owners since this work was started in 1928. Plots which are not satisfactorily maintained are not included in these figures:—

Cultivated Oil palm planting in Native Ownership.

	Total No. of owners.	Total area acres.
On December 31st, 1928	6	21
„ „ „ 1929	27	119
„ „ „ 1930	53	236
„ „ „ 1931	85	352
„ „ „ 1932	218	691
„ „ „ 1933	382	1,014
„ „ „ 1934	704	1,457
„ „ „ 1935	1,382	2,498
„ „ „ 1936	2,278	4,172

The following table shows the progress which has been made in each Province:—

Oil Palm Plots.

Province.	1928–35.		1936.		1928–36.		1928–36.	
	Owners.	Acres.	New Owners.	New Plots Extensions Acres.	Abandoned.		Net Total.	
					Owners.	Acres.	Owners.	Acres.
Benin ...	542	1,343	550	1,314	42	62	1,050	2,595
Warri ...	35	86	18	41	3	9	50	117
Owerri ...	314	393	213	247	28	35	499	605
Calabar ...	197	281	132	122	45	52	284	351
Onitsha ...	190	216	124	165	30	27	284	354
Ogoja ...	16	11	14	13	3	2	27	22
Colony ...	8	5	...	...	5	3	3	2
Abeokuta ..	18	22	17	9	17	17	18	14
Ijebu ...	2	4	...	...	1	2	1	2
Oyo ...	32	39	19	25	18	22	33	42
Ondo ...	...	...	...	...	...	...	1	3
Totals ...	1,354	2,400	1,087	1,936	192	231	2,250	4,107
			Palm Grove Replacement.					
Benin ...	13	40	...	...	7	25	6	15
Owerri ...	4	17	...	...	...	...	4	17
Calabar ...	17	44	8	13	7	24	18	33
Totals ...	34	101	8	13	14	49	28	65

77. The area planted in 1936 alone was equal to 80% of the area which was planted in the eight years from 1928 to 1935, and although the planting figures are very small when viewed relative to the population, and the total area of Southern Nigeria, they represent satisfactory progress. Progress is particularly satisfactory in the Benin Province—63% of the total area planted is situated in the Benin Province and most of this is concentrated in the Benin Division. In the Owerri Province the Bende Division provided the greatest number of new planters, but good progress was also made in the Aba and Owerri Divisions and in the Opobo and Uyo Districts of the Calabar Province. It is interesting to note that twenty-one new owners planted plots in the Itu District of the Calabar Province, which has hitherto been regarded by us as one of the most difficult areas.

78. Continuous propaganda and the example of well kept Native Administration and School plots are steadily breaking down opposition to planting and the idea of cultivating palms is now coming to be regarded with less suspicion and scorn in the more backward areas. Where planting is not limited by conditions of land tenure, and the amount of land available it is anticipated that it will be undertaken on a really extensive scale during the next few years. There are however still many areas where our motives are regarded with extreme distrust. The widespread suspicion that the object of the Government in encouraging the planting of palms is to secure the land or the produce of the palms is less prevalent than formerly, but the suspicion that palm planters will eventually be subjected to a much higher tax seems to be increasing. In many districts it is extremely satisfactory to note that the people themselves are gradually evolving ways and means of overcoming difficulties of land tenure. Such voluntary changes must of necessity take place very slowly.

Oil Palm Demonstration Plots.

79. After the seedling palms have been planted it is essential that the plots should be maintained at such a standard as will ensure that the palms do not receive a check in growth. Although we do not aim at European standards of maintenance, it is imperative that a certain minimum standard should be insisted upon, for if the young palms receive a very serious check and have to compete against a dense growth of bush they will eventually be little better than bush palms, and there is a danger that farmers who have been told by us that the cultivated palm is superior to the bush palm will point to their own neglected plots and say that we have deceived them. It is essential that they should be able to compare the growth of their own palms with that of palms which have been well cultivated. In recent years therefore we have laid down a series of Native Administration plots on which we can demonstrate the standard of maintenance which is necessary, and also show that with adequate cultivation the planted palm really is superior to the bush palm.

80. We have also encouraged the establishment of plots at as many schools as possible. These plots are planted with selected seedlings from our nurseries and both planting and maintenance are carefully supervised by us. We are satisfied that such plots have a high educative value and when they come into bearing they provide a very useful source of revenue for the schools.

The following table gives the number and area of the demonstration plots which have been established to date:—

Oil Palm Demonstration Plots.

Province.	Native Administration.		Government.		School.	
	No.	Acres.	No.	Acres.	No.	Acres.
Benin	...	...	...	...	14	14·7
Calabar	4	7·5	...	...	31	31
Owerri	4	2·5	...	...	35	35
Onitsha	7	11	1	15	37	65
Ogoja	2	3·5	...	...	1	·5
Warri	1	3	...	...	12	7·7
Oyo	...	...	...	...	2	2·2
Colony	...	...	...	...	2	1·5
Abeokuta	4	2	...	...	2	1·6
Total	22	29·5	1	15	136	159·2

Oil Palm Nurseries.

81. Almost every farmer who wishes to establish a palm plot is anxious to obtain seedlings from " selected seed." This demand undoubtedly came as a surprise to us in the first instance, as we thought that the farmers would be satisfied with the obvious superiority of the planted palm over the bush palm even when the former is grown from bush seedlings. Experience has shown however that most farmers are not only prepared to pay for seedlings from selected seed, but will not plant at all unless they can obtain them. We have therefore made most strenuous efforts to meet this demand, and our efforts have been strongly supported by the various Native Administrations who have provided both funds and staff for the provision and maintenance of central nurseries.

The following table summarises the work done at the central nurseries in 1936 and to date:—

Province.	No of Central Nurseries.	No. of seed sown Jan.–Dec., 1936.	No. of seed sown Jan.–March, 1937.	Estimated No. of Seedlings ready for planting in	
				1937.	1938.
Abeokuta	8	146,200	7,450	7,200	12,600
Oyo	1	147,500	nil	6,000	10,000
Ondo	3	16,600	5,700	1,000	5,000
Benin	4	518,000	143,500	20,300	27,700
Warri	3	87,600	35,100	650	2,900
Owerri	11	583,000	70,500	57,000	74,000
Calabar	10				
Onitsha	20	278,700	22,700	19,800	47,800
Ogoja	1	9,000	9,000	100	400
Total	61	1,786,600	293,950	112,050	180,400

82. The above figures indicate that we shall be able to supply seedlings from selected seed, for the planting of approximately 2,000 acres in 1937 and 3,000 acres in 1938. But these figures are a conservative estimate and we hope that the number available in 1938 will be considerably greater than I have suggested, for we have at last secured a considerable improvement in our germination percentages and have developed a nursery technique which both prevents undue losses of seedlings from adverse factors, and accelerates the rate of growth of the seedlings. The slow rate of germination, the lack of an adequate supply of selected seed, and losses of seedlings have hitherto been the main obstacles to rapid progress. I gratefully acknowledge the assistance which we have received from Messrs. the United Africa Company, Limited, in the solution of these problems.

Supply of Selected Seed.

83. Although we have plots of selected palms on all our farms these do not yet provide us with an adequate quantity of seed. Proposals for establishing a palm breeding and seed multiplication station on a large scale are now under consideration, but if planting takes place as rapidly as we hope it will during the next few years, it is unlikely that we shall be in a position to supply all the seed required from Government farms for several years. In the meantime we are obtaining supplies from every source known to us. Since 1935 Messrs. the United Africa Company, Limited, have been kindly supplying us with seed of the Lisombe type from their estate at N'dian free of charge. They have recently agreed to increase the supply to 500,000 seeds per month for the next three months, and to send us surplus seedlings (already 30,000 have safely arrived at Umuahia). This assistance is very highly appreciated by us and it is of the utmost importance to the progress of the work. Supplies of selected seed are also being drawn from selected palms now in bearing on the farm of the Alake of Abeokuta at Loburo, from our best palms at Calabar, from the palms in the Aba plots, and from a group of good soft-shell palms which was discovered at Ugwu Oba in the Onitsha Province. We hope to find other similar areas in due course.

Germination.

84. Experiments carried out by Agricultural Officers and by the Botanist, and experience on the United Africa Company estates have shown that germination can be greatly accelerated by some

form of heat treatment provided that the seeds are kept damp. In the past many consignments of seed either failed to germinate at all or gave an extremely low germination percentage, but at most of our nurseries we can now depend upon an average germination of from 20-25% in six months and with some seed a germination of 60-70% in six months. The Botanist is using an improved type of germinator which has given excellent results so far, and which we hope eventually to instal at all our stations. In the meantime satisfactory results are usually obtained either by heating the geminating trays or by treatment in a smoke house and at Abeokuta particularly good results have been obtained without any heat treatment by using seed from over-ripe bunches. The question of germination is however by no means a simple matter and the results obtained by various treatments at different stations are often most contradictory.

85. It seems to be generally recognised however, that the seed from some trees germinates more freely than the seed from others. This phenomenon has been reported in the Belgian Congo and the Dutch East Indies and has been noted in our own results. It undoubtedly accounts for many of the contradictory results reported in the past, and it is clear that future experiments must be conducted in the light of this variability in germination power. There are also indications that the seed from young trees germinates less freely than the seed from old trees, and this has no doubt been one of the reasons for the poor germination we have obtained in the past as much of our selected seed has necessarily been taken from young trees. Another reason for poor results in the past has been the loss of the germinating seed in the seedbeds caused by the attacks of ants. This difficulty has been overcome by the use of raised germination trays, which have the additional merit that heat may be applied to them for improving germination. There is still much to be learnt about oil palm seed germination however and the whole question is being carefully studied.

Oil Palm Breeding.

86. This work has been in progress since the end of 1927 when controlled pollination of the palms on the Calabar plots was commenced. Until comparatively recently the work was handicapped both by lack of the necessary funds to enable larger areas to be planted with the progenies of the individual selections and by the fact that the palms on the Calabar plots were the only material available for selection. These, although they contain representatives of several types, are not exceptional. Unfortunately the various plots established at Benin and Umuahia for experimental purposes about 1925 contain little material which is likely to be of value for the purpose of selection. The demand of the farmers for selected seed makes it imperative that this work should be pushed forward as rapidly as possible, and the appointment of an extra Plant Breeder who will devote most of his time to it was approved in the estimates for 1937-38.

87. In spite of these handicaps much progress has been made. The plots at Aba which have been recorded for several years have provided new material for selection and some exceptional trees of both hard and soft-shelled types have been discovered there, which have produced average yields of from 300 to 400 lb. or more of bunches over four to seven years. One tree No. UZ890 (hard-shell) has given an average yield of 439 lb. bunches per annum for seven years and trees Nos. UZ864 and UZ931 (soft-shell) have given an average annual yield of 310 lb. bunches for six years. In addition

the United Africa Company, Limited, have kindly consented to supply us with self-pollinated seed from their best trees of the Lisombe type. At present all land which can be spared on our various experimental farms is being used for planting this selected material but this is necessarily limited, as land is also required for experimental work with other crops. The need for the special breeding and multiplication farm mentioned in paragraph 83 above is therefore very great.

88. At present we have seventy-seven acres of land containing some 4,500 trees planted with the self-fertilised progenies of the Calabar palms, and other small plots of Deli and Lisombe types. The Botanists are selecting for both yield and fruit form but as none of the plots of these selected palms are in full bearing we have as yet no data on the inheritance of yielding capacity. We have however obtained important data on the inheritance of fruit type. The information so far obtained may be briefly summarised as follows:—

Hard-shell palms self-fertilised have given:—

95.5% Hard-shell palms.

4.5% Soft-shell palms.

Soft-shell palms self-fertilised have given:—

56.6% Soft-shell palms.

43.4% Hard-shell palms.

Green-fruited palms self-fertilised have given:—

67.8% Green-fruited palms.

32.2% Non-green-fruited palms.

It must be emphasised however that these are merely preliminary results and may require modification when further figures are obtained and more is known about the classification of fruit type. The percentage of palms true to type from naturally pollinated seed is variable but in general much lower than that from self-pollinated seed.

89. As part of the breeding programme, certain plots of palms have been established with selected material to serve as sources of seed. Each plot is isolated and planted with seedlings from palms of one type. When the palms in these plots come into bearing all off-type palms will be removed so that we shall eventually obtain plots in which each palm is of the same type. Seed from such plots will thus have been produced by the intercrossing of palms of similar type and will therefore be the equivalent of self-pollinated seed, which, as indicated above, will give a greater percentage of trees true to type than naturally pollinated seed. Such plots will form an invaluable source of seed for extension work. In later years it will be possible to improve the seed supply from these plots a degree further by removing all poor yielders. So far, only plots of this kind consisting of the ordinary soft-shelled type and the green-fruited soft-shelled type have been established and these plots are relatively very small.

Presses.

90. During 1936 there was a striking and extremely pleasing increase in the use of presses. This is shown in the following table:—

PALM PRESSES PURCHASED BY AFRICAN OWNERS.

	Culley, Massa, etc.	Large Duchscher.	Small Duchscher.	Total.
At December 31st, 1932 ...	44	9	5	58
„ „ „ 1933 ...	44	22	10	76
„ „ „ 1934 ...	50	37	13	100
„ „ „ 1935 ...	57	84	39	180
„ „ „ 1936 ...	60	205	125	390
„ March „ 1937 ...	60	253	140	453

Progress in each Province is shown by the following table:—

PROVINCIAL TOTALS OF PRESSES OF ALL TYPES IN USE.

	At Dec. 31st, 1934.	At Dec. 31st, 1935.	At Dec. 31st, 1936.	At Mar. 31st, 1937.
Colony	1	1	1	1
Oyo	5	5	5	6
Benin	10	17	21	21
Warri	..	...	...	2
Onitsha	40	76	139	176
Ogoja	...	1	1	1
Owerri	16	22	63	67
Calabar	28	58	160	179
	100	180	390	453

91. There was an increase of 210 presses in use in 1936 as compared with an increase of eighty in the previous year, and it is pleasing to note that this rate of progress is being maintained, a further sixty-three presses having been purchased between the 1st January and the 31st March, 1937. The greatest increases have again been in the Calabar and Onitsha Provinces. At the present time most of the presses are owned by middlemen and most of the owners commenced operations by purchasing fruit. This immediately caused a rise in the price of fruit and in most areas the press owner was very quickly forced to revert to the system of pressing for hire. In some cases he hires out the complete press, in others he presses for a cash payment of so much per tin of oil produced. Competition among press owners is very keen and in one area of the Owerri Province has recently forced down the charge for pressing from 1s. 6d. per tin of oil to 7d. per tin. In some areas the owner of the press instead of receiving cash receives a portion of the oil produced —this approximately amounts to half the extra oil which is obtained by the use of the press.

92. It is interesting to note that the greatest extension of the use of presses has taken place in areas which normally produce "semi" oil, *i.e.*, oil containing up to 32% F.F.A. The premium for soft oil over semi oil is always greater than the premium between any other two grades, and it pays the press owner to obtain this premium. But at present he does not find it an economic proposition to produce oil of the highest quality. Although the use of the press enables the owner to produce oil of 5% F.F.A. or under if he wishes to do so, except under exceptional circumstances he does not find the extra premium for such oil sufficiently attractive; he has often found it more profitable to purchase semi or soft oil and mix it with his press oil until the resulting mixture is just inside the limit for soft or edible oil as the case may be at the time of sale.

The result of such mixing is that after a week or ten days there is a rise in the F.F.A content so that oil which was bought as edible becomes soft, and soft becomes semi. This is obviously an undesirable practice from our point of view and that of the buying firms, but it is very paying for the press owner. It seems however that the practice has now been effectively checked by the action of the firms who refuse to pay the full price for this mixed oil immediately. They pay the price for semi oil and the balance later if further tests show that there has been no rise of F.F.A. Even in the hard oil areas there is evidence that interest in the press is gradually being stimulated and during the year one press was sold to an owner in the Sobo Division of Warri Province.

Nut Crackers.

93. There is still a real need for a cheap but efficient hand operated nut cracker and there have recently been developments in this direction. A Knox nut cracker which is much superior to previous models, is now marketed at £25 and a Duchscher cracker at £35 is also on the market. These are both being tested and appear to be efficient machines, but both are too expensive to meet the popular demand. We are now testing a light machine which has been invented by Mr. G. D. Crerar of the Public Works Department and which would cost approximately £15. Some modifications will be required and certain parts will require strengthening but the machine has possibilities.

Export of Pineapples.

94. The following figures give the number of fruits exported by seasonal years (August 1st.-July 31st.):—

	No. of Exporters.	No. of Fruits.
1931-32	3	2,161
1932-33	4	1,260
1933-34	12	4,659
1934-35	8	2,705
1935-36	4	6,278
1936-37	5	2,374 (to end of March, 1937).

95. Weather conditions during the early part of 1936 were particularly favourable for the pineapple crop and the absence of harmattan and a well distributed rainfall during January and February so reduced seasonal deterioration in the shipping quality of the fruit, that it was possible to continue to export up to the end of February, thus allowing a much greater proportion of the early season crop to be exported than usual. Exports from the mid season crop were also satisfactory so that the total export of 637 cases containing 6,278 fruits was the highest yet recorded. The conditions for the 1937 crop were unfortunately much less favourable and shipments had to be suspended early in February.

96. Extension work on the production of pineapples for export is now being cautiously undertaken. A few selected farmers in the Sango Otta District have established plots in accordance with our recommendations, and so far they seem satisfied with the results obtained. Owing to the fact that the small size of fruit required for the export trade is practically unsaleable locally we do not feel justified in advocating rapid extension of this work until we are quite satisfied that each farmer will be able to export practically the whole of his crop. Extension will therefore be strictly regulated until our investigations have reached a more conclusive stage.

Export of Oranges.

97. The rainfall during the first nine months of 1936 was abnormally low, particularly during the months of June, July and August with the result that the orange crop was very small. This was unfortunate for owing to the political disturbances in Spain shipments made in the early part of the season were reported to have averaged 14s. 6d. per case. A further development was an inquiry from Messrs. J. J. Lyons & Company for regular shipments up to 500 cases per month, but the smallness of the crop made it impossible for the exporters to undertake the venture, and the opportunity thus afforded for the immediate expansion of the industry on a sound basis was unfortunately lost.

Grapefruit Planting.

98. Our general policy with regard to grapefruit planting, and the organisation which we have evolved for the supply of planting material was described at length in last year's report (paragraphs 59-62). There is still a big demand for planting material, and farmers are anxious to plant larger areas than we consider advisable at this stage. While we are in a position to meet all demands for budded trees for 1937, we are not anxious to encourage planting at too rapid a rate until we have more data as to yield, pests and diseases, and the economics of the industry. In recent years there has been a very big increase in the production of grapefruit in other countries and it seems certain that our producers will have to accept a price much lower than they have hitherto anticipated. There is little doubt that a successful industry can be built up if the Nigerian farmer can produce and market his fruit sufficiently cheaply, but we have not yet had a sufficient quantity of fruit to send home commercial consignments, and we do not yet know the price at which production ceases to be profitable. Our policy at the moment is to supply planting material in limited quantities to farmers who ask for it. We are maintaining the comparatively high price of 1s. per tree for the present in order to cover the cost of production, and to provide funds for building up a co-operative marketing organisation.

99. Planting by registered growers has been as follows up to the end of 1936:—

Planting of Budded Grapefruit for Export.
Approved Farmers' Plots.

	Colony.		Abeokuta.		Oyo.		Total.	
	Farmers.	Trees.	Farmers.	Trees.	Farmers.	Trees.	Farmers.	Trees.
Total at end of 1934	4	60	2	40	...	...	6	100
" " " " 1935	11	163	28	152	...	...	39	315
" " " " 1936	35	375	109	598	13	501	157	1,474
Abandoned to date	2	11	...	...	...	...	2	11
Losses " "	...	25	...	146	...	117	...	288
Net Totals ...	33	364	109	452	13	384	155	1,175

100. A programme of experimental work in connection with both grapefruit and oranges is being carried out at Moor Plantation, and at other stations, which includes root stock trials, investigations on scab disease of citrus, and on citrus sucking insects. In the root stock trials sour orange stocks have so far given the best results as judged by the yield of grapefruit.

Fruit Juice.

101. Our work with both citrus and pineapples would be on a sounder basis if we could establish an export trade in fruit juice, as this would provide a market for fruit which was not of exportable quality. Experiments in the extraction of orange juice have been made at Agege and trial shipments were made by Messrs. John Holt & Company who have given us valuable assistance in this matter. Reports indicated that the results of these shipments were very satisfactory, the only criticism being that the juice contained rather a low percentage of fruit cells. This is a point which we are now rectifying. A simple technique for hand extraction has been worked out and a local contractor has now come forward who proposes to test the possibilities of the industry on a commercial scale, Messrs. John Holt & Company having undertaken to provide the necessary wax lined containers. Experiments with the extraction and shipment of pineapple juice are also in progress.

Experimental Work with Cocoa.

102. In our study of cocoa problems we are in a fortunate position. Production is increasing steadily and it is unlikely that a set-back will occur in the near future. We therefore have time to go ahead with our experimental work in preparation for the time when the farmer will require assistance. Signs are not wanting that such assistance will be needed sooner or later, for in the older areas such as Agege cocoa is already dying out and so far the owners have made no attempt to regenerate these old plantations.

103. The two problems of how to regenerate old cocoa and how to prolong the life of mature plantations which have not yet commenced to die out is being studied by the Botanists. In previous reports mention was made of the pruning and thinning experiments carried out at Ajia. At first the results indicated that pruning and thinning of mature cocoa would have a beneficial effect, for after the first year the treated plots all produced a better yield than the controls. The experiment has now been in progress for five years and the results are far less satisfactory. Two of the treated plots are still healthy and still yield more heavily than the controls, but on the other two the yields have been steadily going down and are now less than the controls. Their appearance is not good and a number of stands have died out. The owner, impressed with the increased yields in the early years decided to do some pruning on his own in one of the controls with the result that where he pruned the trees began to die out rapidly and the area is now very bad. It seems to be extremely easy to ruin good cocoa trees, and is probable that with mature cocoa thinning is unnecessary and may even be injurious. Similarly pruning must be undertaken with caution and should be limited to the removal of dead wood and unwanted chupons.

104. Attempts are now being made to regenerate the plots which have been damaged, and arrangements are also being made with certain owners to allow us the use of cocoa plots for carrying out regeneration experiments at Agege. The Ajia plots which are estimated to be between twenty and twenty-five years of age contain plots of mature cocoa, plots where the older trees are beginning to die back and plots where the trees have already died out. Similar plots are being obtained at Agege, and also a plot of young cocoa.

105. Each plot is being considered individually, and every endeavour is being made to protect both the trees themselves and the soil. Where a tree dies, it is cut out and the vacancy thus

created is supplied with a seedling from selected seed. In plots where the trees have already died out *Tephrosia candida* is first planted to give side shade and to improve the soil, and young cocoa is planted when the *Tephrosia* is well established. The soils on all plots have been examined by the Agricultural Chemist and on certain plots artificial fertilisers are to be tried. It is by no means certain that cocoa regeneration will be possible in Nigeria. Effective methods can only become apparent after extended trials and in any case the results of these experiments will not be available for at least five years.

Selection and Breeding of Cocoa.

106. Cocoa selection and breeding work was commenced in 1931, and is at present confined to selection for high yield. As with oil palms the basis of the original selection was a narrow one, being confined to a plot of cocoa on Moor Plantation which has been recorded since 1921. A search for an additional selections by recording on native farms will shortly be undertaken. Altogether nineteen trees have been selected, the best of which are definitely outstanding, and the experiments which have already been laid down comprise some 15,000 individual trees all bred from these original selections.

107. The experimental work now in progress includes clonal multiplication of selections, testing of yield inheritance and the effects of cross- *versus* self-pollination of the original selections. With a view to a possible improvement of quality at a later date a number of introductions from Ceylon and the West Indies have been made, and are being grown at Moor Plantation.

Black Pod Disease of Cocoa.

108. The experiments carried out at Ajia have conclusively proved that black pod disease can be kept under control in the South Western Provinces of Nigeria by very simple measures, which any native farmer can carry out. These consist of the regular harvesting of all ripe pods—at three to four weekly intervals during the fruiting season—the removal of all dead wood after the trees have flushed in April, and the removal of all dead pods. The latter need not be carried away from the plot. It is sufficient if they are merely removed from the trees and thrown on the ground.

Cassava Mosaic.

109. The Plant Pathologist has for some years been investigating possible methods of controlling Cassava Mosaic a virus disease which the Entomologist has shown is transmitted from plant to plant by a species of white fly. This disease is known in other countries but was first recorded in Nigeria in 1926, and it has gradually spread from the Coast as far North as Ilorin. It causes a considerable decrease in the yield of Cassava, and as the latter is an important food crop in most parts of Nigeria the investigation seemed to be of real practical value to the farmer.

110. The disease cannot be controlled by the alteration of planting dates so that attention has chiefly been paid to the breeding of resistant varieties. A collection of Nigerian varieties was made in 1932; varieties reported to be resistant have been introduced from the Gold Coast and Sierra Leone, and further new varieties have recently been introduced from Trinidad. No variety has shown complete immunity, but a number have varying degrees of resistance. Breeding work has not proved to be simple as some varieties do not flower at all, and others produce only male or female

flowers. But progress has been made and we now have a few strains in which a very high degree of resistance appears to have been built up. In some cases varieties have shown a high degree of resistance for a few years and have then begun to go down to Mosaic again. Further tests are required before we can be certain that our strains are truly resistant.

Rice Growing in Mangrove Swamps.

111. Our attempt to introduce the growing of rice in Mangrove Swamps is developing slowly. Extension work has so far been confined to the Jekri-Sobo Division of the Warri Province. Progress is handicapped to some extent by land difficulties. The swamps are chiefly owned by Jekris whose enthusiasm for this kind of work is very lukewarm. Unfortunately they are not prepared to allow other people the use of the land. A further handicap is the lack of a suitable hulling machine which can be worked by hand. It is hoped however that a suitable machine will shortly be obtained from Malaya. In 1935, eleven farmers grew rice on 4.85 acres and eight of these continued in 1936, in which year a total of twenty-two farmers grew 12.30 acres. Experiments which have been carried out on tidal mangrove swamps near Calabar and Oron have given satisfactory results, but so far no farmers in this area have yet come forward who are willing to give rice growing a trial.

Poultry.

112. The village poultry improvement scheme is being received almost everywhere in the Southern Provinces with more enthusiasm than we anticipated and we have been unable to meet many requests for birds. We have therefore made arrangements to increase the number of birds available for distribution by starting poultry pens at both Benin and Onitsha in addition to those at Ibadan and Agege, and by increasing the scope of the work at Ibadan. Experiments are in progress at Ibadan and other stations to ascertain what proportion of Rhode Island Red blood produces birds most suited to village conditions. Arrangements have been made for the introduction of new blood from England at regular intervals. Up to the end of 1936 the distribution of cocks to villages which had agreed to kill off all native cocks was as follows:—

Abeokuta Province	10	cocks	to	7	villages.
Oyo ,,	2	,,	,,	1	village.
Onitsha ,,	16	,,	,,	13	villages.

Agricultural Education.

113. The first class of five students recruited from the Yaba Higher College completed their course at Ibadan in January, 1936 and all were awarded the Higher College Diploma. Four of these were given appointments as Agricultural Assistants. Their future progress will be carefully watched and every effort will be made to give them experience and training which will enable them to gradually assume greater responsibilities.

114. A course for training elementary rural school teachers in Agriculture has been started by the Education Department and is being held at Moor Plantation, and a similar course will be started next year on our farm at Umuahia. The Agricultural Department is co-operating as closely as possible with the Education Department in this work for there is no doubt whatever that the rural schools can do a great deal to assist us in introducing improved agricultural methods. In the Northern Provinces a similar course on a very small scale has been started on our farm in the Benue Province,

and at the suggestion of the Emir of Katsina preparations are being made for starting a course for training illiterate farmers' sons in practical mixed farming at the Farm Centre at Kafin Soli. We are also in close touch with the Elementary Training Centre at Bauchi and the students there are receiving both practical and theoretical training in connection with mixed farming.

Co-operative Societies.

115. All but two of the Co-operative Societies which were originally started by the Agricultural Department for the co-operative sale of cocoa and were formerly supervised have now been taken over by the Registrar of Co-operative Societies and are therefore dealt with in his report. The assistance which we have received from the Registrar and his staff is greatly appreciated by us. They have relieved us of all the routine work in connection with the organisation of the societies and have thus enabled Agricultural Officers to give their undivided attention to Agricultural extension work. The Co-operative Department is rightly not a branch of the Agricultural Department, but the work of the two Departments is very closely interwoven and is complementary. The fact that the Registrar of Co-operative Societies lives at the Headquarters of the Agricultural Department is a great advantage to us both, and enables the two Departments to work together in complete harmony.

Produce Inspection.

116. In recent years the practice of adulterating groundnuts with such foreign matter as stones, sand, beans and guinea corn has been steadily increasing, and evidence was forthcoming to show that as a result the groundnuts from Northern Nigeria were steadily losing in value in the international markets. In order to stop this practice in December, 1936 regulations [Groundnuts (Inspection for Export) Regulations, 1936] were introduced which prohibited the export of groundnuts so adulterated. Under these Regulations all groundnuts from Bornu, Kano, Katsina, Sokoto and Zaria Provinces except those covered by certificates showing that they are of French origin are inspected before being railed. A strong Advisory Committee was appointed to advise on the working of the scheme and thanks to the assistance of the Committee, and to the co-operation of the merchants generally the inspection was carried out quite smoothly and appears to have given complete satisfaction. The cost of the scheme is met by a fee of 3d. per ton on all groundnuts exported. The scheme is thus both efficient and cheap, and such a small fee cannot possibly cause any hardship to the producers.

117. Originally the Advisory Committee recommended that the amount of foreign matter allowed should not exceed $3\frac{1}{2}\%$, but this limit was found to be too high, and the Committee subsequently recommended that " That the maximum percentage of adulteration in groundnuts of exportable quality should not exceed 2% of shell and other foreign matter including stones and other mineral matter which shall not exceed 0.1%." This recommendation was accepted by the Government and is the standard which has been adopted. The chief adulterants found were stones, sand, added shells, beans, guinea corn, pieces of broken pots and animal dung, and a total of ninety-six successful prosecutions were taken. Judging by the number of prosecutions in each area it seems that adulteration is most rife in the Ringim and Kaura Namoda areas. This matter will be investigated more fully next season.

118. Inspection takes place at the time of railing, but when railing is not actually taking place the examiners visit the various points in their stations and examine the groundnuts brought in by producers and middlemen. There is every reason to hope that the inspection system together with propaganda by both Agricultural and Administrative Officers will gradually put a stop to the practice of adulteration.

119. In December, 1936 the Palm oils, Palm kernels and Cocoa Inspection for Export Regulations were applied to the Cameroons which had previously been exempt. This extension was strongly opposed by the German plantation and trading interests, although it was supported by the British firms. The opposition was chiefly directed against those regulations which prohibited sale and movement of wet cocoa, the argument being that under Cameroons conditions the native farmers could not produce high quality cocoa. As subsequent investigations have shown that 47% of the cocoa exported from the Cameroons is handled exclusively by the farmers themselves there is little force in this argument. In order to avoid serious dislocation of trade and hardship to the producers by rigid enforcement of the regulations at short notice, concessions were granted to firms owning suitable fermentaries to continue the trade in wet cocoa temporarily, and it seems likely that these concessions will have to be continued in the Victoria Division until the farmers have received more instruction in the correct method of fermenting cocoa.

120. In Southern Nigeria the Produce Inspection Regulations have continued to work smoothly. A Committee of Inquiry was appointed by the Nigerian Government in September, 1936, to review the position with regard to the system of inspection. This Committee reported that "There is no question but that the existing system must continue for many years to come and may well be considered to all intents and purposes as a permanent institution. We are impressed with the argument that so long as production is in the hands of small farmers and peasant proprietors a system of produce inspection by the Government will be desirable and necessary." It also recommended some much needed improvements in the conditions of service of the African staff. These recommendations are still under consideration, but if they are finally approved I believe that they will encourage a better type of African to join the service thus reducing the number of terminations of appointment which is still much greater than it should be. The Committee also recommended an increase of three in the number of Produce Inspectors and provision for this increase has been made in the Estimates for 1937-38. This extra staff will enable us to give closer supervision to the more remote Inspection Stations and will therefore result in more efficient inspection.

Cocoa Grading.

121. The grading of the main cocoa crop for the Western Provinces in recent years is given in the following table. By main crop is meant all cocoa graded during the period 1st October to 28th or 29th February, which weighed over 10½ oz. (11 oz. prior to 1935-36) per 300 beans.

Grading of Main Crop—Western Provinces.

	Grade I, Per cent.	Grade II, Per cent.	Grade III, Per cent.	Total Main crop, tons.
1932–33	18	72	10	53,000
1933–34	17	73	9	47,000
1934–35	27·1	68·2	4·5	55,000
1935–36	29·9	69·2	0·8	67,000
1936–37	19·35	80·23	0·42	80,144

The total Nigerian main crop for 1936-37, including the cocoa produced in the Eastern Province, amounted to 81,012 tons and was graded as follows:—

		Tons.	
Grade I	...	16,091	19.86%
Grade II	...	64,520	79.64%
Grade III	...	401	0.5%

122. Owing to the abnormal season the bulk of the crop was later than usual and there was a very marked decrease in the size of the beans. There was, however, a notable decrease in the quantity of mouldy cocoa. There was also, unfortunately, a decrease in the proportion of Grade I cocoa which since 1931-32 had been steadily rising. This set-back however need not be regarded too seriously, as it was almost entirely due to the rapid rise in prices during the important part of the season. Farmers were so anxious to market their cocoa as rapidly as possible that they did not take time to ferment it. Also as the premium for Grade I over Grade II was comparatively small—9s. 2d. per ton in December, and 15s. 1d. per ton in January—farmers could not afford to risk losing the advantage of a rising market in order to secure it. Prices reached their highest point on the 18th January when the £48 2s. 6d. per ton for Grade I was quoted at Lagos. It is satisfactory to note that the proportion of Grade III cocoa is now almost negligible. There is general agreement among the merchants that the grades are now satisfactory, but although there is at present no demand for a division of Grade II it is quite possible that we may eventually have to come into line with the Gold Coast and institute a second grade of fermented cocoa.

Appendix I and II.

123. A summary of recent Agricultural Legislation is given in Appendix I and of our last year's expenditure and revenue in Appendix II.

J. R. MACKIE,
Director.

Moor Plantation,
Ibadan.

APPENDIX I.

Summary of Important Agricultural Legislation passed during the period 1st April, 1936 to 31st March, 1937.

1. Regulations No. 37 of 1936—The Groundnuts (Inspection for Export) Regulations, 1936 were made on the 14th September, 1936, and came into force on 10th December, 1936. The regulations provide for the Inspection of all groundnuts produced in the Provinces of Bornu, Kano, Katsina, Zaria and Sokoto, before they can be railed for export, their object being to ensure that groundnuts exported from Northern Nigeria shall be free from admixture with adulterants. There is a regulation which exempts from Inspection groundnuts produced outside Nigeria. The Regulations stipulate that before being passed for export all groundnuts must be thoroughly dry, but do not fix a standard of purity, this matter being left to the Advisory Committee. The latter subsequently recommended that the maximum percentage of admixture with foreign matter should not exceed 2% and that in any case the proportion of stones or other mineral matter should not exceed 0.1%. This recommendation has now been incorporated in the Regulations. The Regulations also provide for an inspection fee of 3d. per ton, for the appointment of an Advisory Committee, and of Inspectors, and give to Inspectors of Produce powers of search and seizure.

2. Order in Council No. 64 of 1936.—This order made under the Cultivated Oil Palm Ordinance authorised the extension of the provisions of this Ordinance to the Cameroons Province as from 1st December, 1936.

3. Palm oils, Palm kernels and Cocoa (Inspection for Export) (Amendment No. 2) Regulations, 1936.—This amendment authorised the extension of the Produce Inspection System to the Victoria and Kumba Divisions of the Cameroons Province as from 1st December, 1936, with the proviso that the inspection of cocoa should not commence until 1st April, 1937.

APPENDIX II.

Statement of the Expenditure under Head 4, Agriculture for the financial year 1936-37.

		£	s.	d.
	Personal Emoluments	52,338	1	1
	Less Reimbursement by Native Administration	3,907	13	0
	Net Total, Main Branch	£48,430	8	1
	Personal Emoluments, Produce Inspection ...	28,030	9	6
	Total, Personal Emoluments	£76,460	17	7
	Other Charges, Annually Recurrent.			
37.	Passages	3,522	8	6
38.	Transport; Monthly Allowances	425	5	9
39.	Transport; Mileage, Hire and Carriers ...	4,220	0	9
40.	Transport; Materials and Stores	71	8	1
41.	Railway Transport	3,438	3	9
42.	Travelling Allowances	712	8	0
43.	Telephones	191	16	9
	Carried forward	£12,581	11	7

		£	s.	d.
	Brought forward	12,581	11	7
44.	Stationery	182	12	1
45.	Contingencies	40	18	7
46.	Books and Periodicals	120	6	3
47.	Uniforms	7	10	11
48.	Artisans, Overseers, etc.	603	1	6
49.	Labour	5,420	18	1
50.	Poultry Farms	117	1	4
51.	Development of Cotton Industry	219	9	7
52.	Farming Equipment	1,165	0	6
53.	Rent and compensation for Land acquired for farm	63	19	5
54.	Upkeep of Laboratories	461	1	2
55.	Palm Oil Extension Work	800	11	10
56.	Cocoa Extension Work	87	8	5
57.	School Equipment	38	14	7
58.	Development of Fruit Trade	21	17	1
59.	Water Supply, Nassarawa Farm	15	13	2
60.	Hostel Charges	74	3	1
	Total	£22,021	19	2
	Less Reimbursement by Native Administrations	1,326	3	11
	Net Total, Other Charges, Main Branch ...	£20,695	15	3
	Produce Inspection.			
61.	Passages	926	19	2
62.	Transport; Monthly	244	15	2
63.	Transport; Mileage, Hire and Carriers ...	1,555	12	11
64.	Transport; Materials and Stores	56	3	0
65.	Railway Transport	579	17	1
66.	Travelling Allowances	192	11	6
67.	Rent	54	8	0
68.	Seals and Presses	2,220	1	3
69.	Stationery	50	8	4
70.	Temporary Buildings	1,054	15	3
71.	Contingencies	32	5	0
72.	Bush Allowances	65	19	10
73.	Upkeep of Launch	800	3	6
74.	Telephones	138	19	3
75.	Produce Testing Apparatus	17	19	2
76.	Provident Fund Bonus, etc.	928	16	10
77.	Colonial Charges	877	8	2
	Total Other Charges, Produce Inspection ...	£9,797	3	5
	Summary.			
	Personal Emoluments	76,460	17	7
	Other Charges	30,492	18	8
	Total	£106,953	16	3

Special Expenditure.

		£ s. d.
78.	Typewriters for Produce Inspectors	180 16 11
79.	Experimental Farms in Ilorin Province ...	—
80.	Maintenance and Equipment, Sokoto Rice Mill	840 11 8
81.	Arrears of Maintenance of Government Agricultural Farms	1,253 11 9
82.	Water Supply, Kano Farm	329 12 7
83.	Buildings and Improvements, Government Agricultural Farms	1,169 17 0
84.	Arrears of Samaru Stock Farm	515 13 5
85.	Buildings and Improvements	13 1 6
	Total	£4,303 4 10

Revenue, 1936-37.

Head 2.—Fees of Court or Office, Reimbursements, etc.

Item 14.	Sales, Agricultural Produce ...	£1,026 18 1

Head 8.—Produce Inspection.

Item 1.	Fees, Inspection	48,667 19 8
,, 2.	,, Overtime and rebagging ...	876 15 1
		£49,544 14 9

GENERAL SUMMARY.

Agricultural Services—General.

Expenditure.	£ s. d.	*Revenue.*
Personal Emoluments (net) ...	48,430 8 1	
Other Charges (net)	20,695 15 3	
Special Expenditure	4,122 7 11	
Total	£73,248 11 3	£1,026 18 1

Produce Inspection.

	£ s. d.	
Personal Emoluments ...	28,030 9 6	
Other Charges	9,797 3 5	
Special Expenditure	180 16 11	
Total	£38,008 9 10	£49,544 14 9